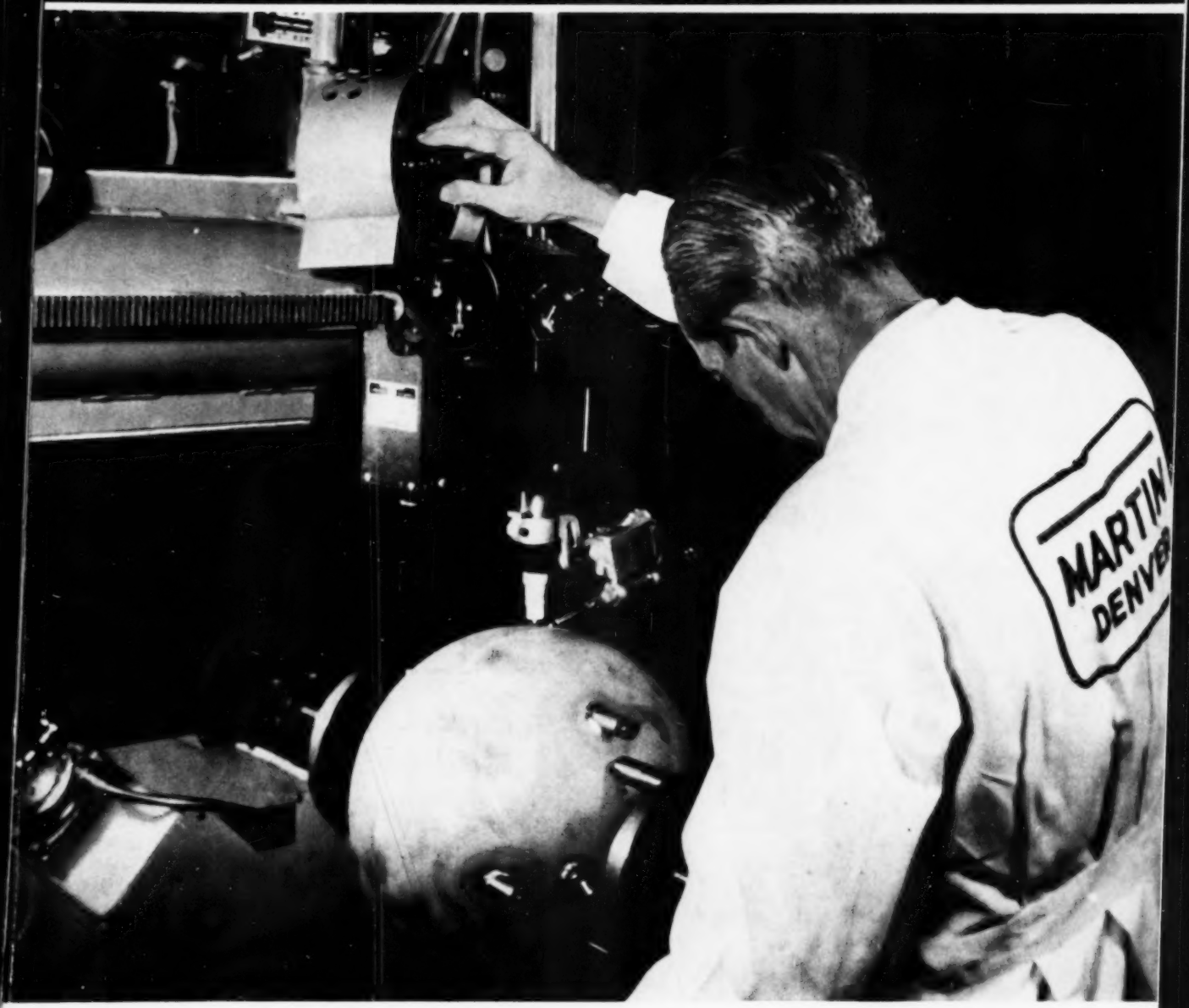
American Machinist

FEBRUARY 9, 1959 75¢

McGRAW-HILL MAGAZINE OF METALWORKING PRODUCTION

Safer Setups for Presses

SPECIAL REPORT Page 105



Time cut 90% in welding stainless spheres for Titan ICBM—see page 92

NEW EVERY ISSUE FEATURE

METALWORKING REPORT

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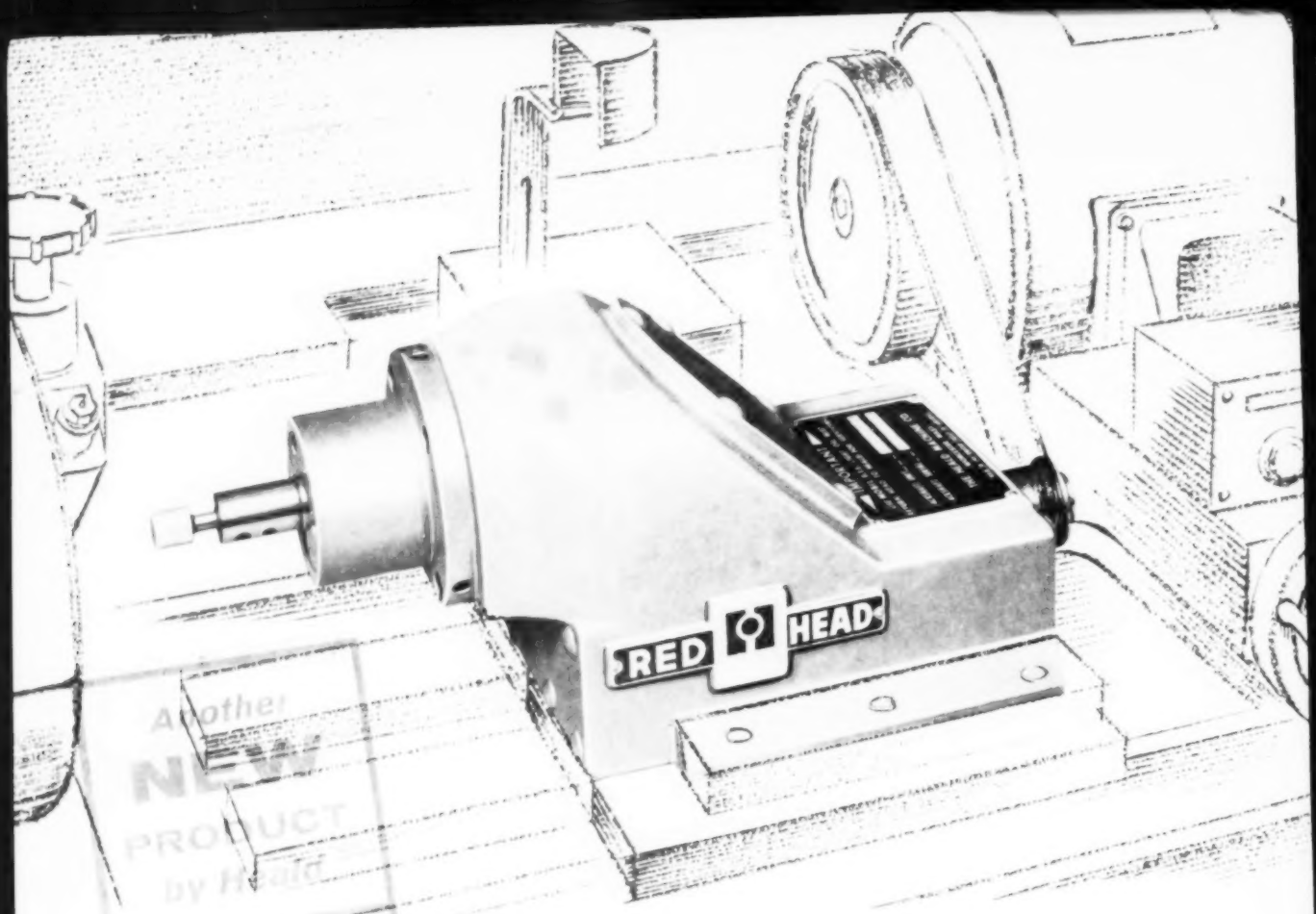

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for speeds to 100,000 rpm

THE NEW Heald Red Head Hi-Speed belt-driven wheelhead offers a practical, *low-cost solution* to the problem of getting proper wheel speeds for small hole work where high frequency generating equipment is not available. It provides speeds from 45,000 to 100,000 rpm with simple belt drive from a standard electric motor!

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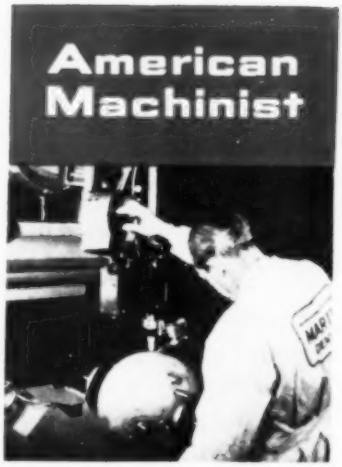
METALWORKING REPORT

SIGNIFICANT CURRENT DEVELOPMENTS IN TOOLING AND PRODUCTION PROCESSES



COVER:
Type 321 stainless is welded into spheres for Martin's Titan missile on modified Airco welder. This and other tooling data in article on page 94.

CUTTING

Nonferrous "Magnetism"

Revolutionary new chuck can hold any electrically conductive material —ferrous or nonferrous, thick or thin. Developed by Electro-force Inc, Fairfield, Conn, new chuck is similar to electromagnetic chuck in operation but radically different in principle. It gets its holding power through static electrical charges of opposite polarity imposed on the chuck surface and work surface. Sine plate and rotary table based on same principle as chuck are being developed. See page 91.

Value of Adjustable Speed

A hydraulic adjustable-speed drive may produce savings of as much as $30,000 or as little as $1000 during the normal 10-year life of a lathe. Formulas to compute the amount that you can justifiably spend on stepless drives have been developed by Prof Milton C Shaw at Massachusetts Institute of Technology, under a research grant from Shell Oil.

Adjustable-speed drives are most important for facing operations. Under average conditions, you will be justified in spending $30,000 extra if the lathes will be used with high-speed tooling, $20,000 with carbide tooling, $15,000 with ceramic tooling. Actual cost of such an attachment is likely to be $10,000 and would thus be justified in all cases.

For lathes used primarily for straight turning under average conditions, a cost of $2500 with high-speed tooling and $1000 with carbide tooling would be justified. Drives for such machines need not be automatically regulated hence can often be purchased for these prices.

Dr Shaw's calculations assume that the lathes will be operated to yield optimum machining cost per piece both with finite speeds and with stepless speeds. No credit was allowed for the improved finish possible with stepless drives.

Ceramics Replace Grinding

More aluminum oxide will go into ceramic tools and less into grinding wheels if two recent examples start a trend:

1. Hardened-steel gears are now finished with oxide tools instead of by internal grinding at Kearney & Trecker. Blanks are SAE 4150 and 4615 steel and SAE 64 bronze. Ceramic boring gives comparable finish to grinding, takes less time.

2. Piston rods at Gradall are finish turned with oxides, polished at a backstand grinder with 240 and 400-grit belts. These operations replace rough and finish grinding. Details on page 114.

FORMING

Ultrasonic Extrusion

Extrusion of metal by ultrasonic energy is in early developmental stage, W C Potthoff, vice president Aeroprojects Inc, West Chester, Pa. has revealed. Rate of extrusion can be increased, or force for given extrusion rate can be reduced.

Inexpensive Profile Forming

Profiles on ID of work can be quickly and accurately formed without expensive tooling on a machine marketed by Meta-Dynamics Div, Cincinnati Milling Machine Co. Looking much like a lathe, the machine has four pulsating dies which, revolving around the work on a shaped mandrel, squeeze the work to the shape of the mandrel. Stock is fed over mandrel toward rear of headstock so that long parts can be formed on relatively short mandrel. Rifle-barrel chambering, internal ratchet teeth, bonding of tube linings, forming of lands and grooves in rifle barrels are among jobs machine will do. (See page 133.)

Coined Iron

Coining of sand-cast, malleable-iron bead rings is being used by Canton Malleable Iron Co to eliminate expensive machining. The ID, face, and most of the top area of the rings are coined. Bead rings range from 12 to 18 in. dia, are assembled from four to six sections. When assembled, the ID must be within ±0.010 in. and the distance from the mounting face to the underside of the bead is within 0.0075 in. at any point on the periphery. Bead rings are used on missile carriers, deluxe railroad passenger cars, and large buses.

Dwarf Soviet Heavy Press

The Soviets have now designed a "dwarf" heavy forging press of 30,000 metric tons capacity, but roughly only one-third as high as the conventional multi-story heavy press (Schloemann) as used in the aircraft program. Important feature is replacement of the usual upright press columns with a heavy-walled cylinder, which can be made, it is claimed, of prestressed concrete. Ram stroke has been shortened, because Soviet engineers say that the long stroke is seldom used. A 300-ton model was displayed last year at the Moscow All-Union Industrial Exhibit and a 2,000-ton model is planned for the 1959 exhibit.

Hot-Forming of Titanium

Sizing and stress relieving of titanium parts for Crusader fighters is being speeded on horizontal hot-forming press designed and developed by Chance Vought. The press has two electrically heated platens, plus two horizontal rams that exert pressure from the sides, and a third platen which exerts downward pressure.

The operator loads one platen while the other one is in the press. Automatic controls move the dies and part into position and lock the rams for from one to 60 min.

HEAT TREATING

Instant Quenching

Induction heat treating at extremely high frequencies makes possible heating and treating of many materials previously considered untreatable. One high-frequency unit is currently being used to heat treat parts under water. When the heating cycle is completed, the surrounding water provides an immediate quench. Also developed by Radio Frequency Co, Inc, Medfield, Mass, is a unit Bell Lab uses in zone refining of ferrites and similar materials. It operates at 120 megacycles (which puts it in a class by itself) and is said to be in tune at all times.

WELDING

Larger Parts from Tantalum

Tantalum linings for pressure vessels and for other equipment where corrosion is a problem are now practical as a result of improved welding techniques and availability of bigger tantalum sheets.

Word of caution: 1) Avoid low-ductility welds by shielding carefully the weld zone, because the molten metal reacts readily with gases and other metals; 2) quick chill after welding to avoid distortion.

Gas tungsten-arc (Tig) welding, with trailing shield or in atmosphere chamber, now produces the best product, Pfaudler Permutit Inc reports. However, electron-beam welding in a high vacuum holds promise for super-critical applications (rockets missiles, atomic energy) where cost is justified.

Large tantalum sheets are product of consumable-electrode vacuum-melting technique (for titanium and zirconium) adapted recently to tantalum by Haynes Stellite Co.

INSPECTION

Tape-controlled "Inspector"

Automatic inspection machines closely resembling machine tools may soon be a basic part of many machine-tool lines, with sensing probes taking the place of cutting tools. Pratt & Whitney Co, West Hartford, Conn, has developed a numerically controlled inspection machine for intricate shapes.

Each inspection point is programmed on a punched paper tape, then internal and external gage heads are automatically moved from point to point. Dimensions, accurate within 0.000150 in., are fed to an IBM Automatic Production Recorder, which also will provide a print-out.

Control system for the inspection machine is basically the same as that used on the P&W jig borer. Read-out of recorder can provide either direct dimensions or deviation from normal. Details on page 101.

Fine Testing of Tape

Tape-testing machine recording up to 42 million pulses on a 2500-ft reel of tape has been announced by Audio Devices Inc, magnetic tape maker. It incorporates digital counters that indicate the number of pulses in a tape defect and number of defects in a reel of tape. It checks each pulse for playback and rejects any tape with a single pulse failure. Company points out that as many as 2000 bits of information may have to be crowded into a linear inch of tape.

ASSEMBLY

Wire Wrapping Faster

Wire wrapping in place of conventional wiring and soldering is being used by Philco Corp on TV receivers, where wires are jumped from retangular lugs on printed-circuit boards to other parts of the chassis. It can be done faster and does well in service. At first, solder was added to the wrapped joints, but proved unnecessary after Bell Telephone introduced wire wrapping some years back.

Mechanize Insert Assembly

First application of automatic unit that assembles threaded inserts into non-ferrous parts is at Ford's Sharonville (Ohio) plant, where three inserts are power-assembled into an aluminum transmission housing at rate of 120 housings/hr. Inserts go into a flange that supports the starter motor. Machine is part of a Majestic transfer unit in which housings are carried on transfer bar with pads and locating pins. Assembly spindles butt against housing flange under hydraulic power; then inserts are fed from hopper and driven into the housing. Critical point; getting the inserts started into the pre-tapped holes right, so they can't cross-thread. A threaded end on each feed spindle aligns the inserts so they enter correctly.

Bond Without Glue

High temperature and pressure are enough to bond sheets of zirconium together—and perhaps other materials eventually. Sheets are for atomic reactors, and must be undistorted and non-contaminated. They are assembled in an autoclave where the space between them is evacuated, then 1550 F and 10,000 psi are applied for 5 hr. This produces diffusion and grain growth across the interface to make a true direct metal-to-metal bond. Sheets must be cleaned thoroughly and abrasive-belt ground (which leaves no contaminating grit on the metal). Behr-Manning produced experimental sheets for Battelle Institute and Westinghouse, who reported the new method at the Geneva (Switzerland) conference.

Dye for Short Runs

A good way to identify plastic fasteners during assembly is by color—if quantities are large, color can be molded in, but for short runs the color can be dyed. Colorite Industrial Dyers, New York, have been coloring washers, screws, clips, gears, grommets, jacks, and rivets made from nylon, polyesters, styrene, polyethylene, and acetate. Process is fast and inexpensive; colors can be made to comply with RETMA codes.

FINISHING

Fatigue Lifted by Tumbling

Barrel finishing can increase fatigue life. This discovery, one of a chain that has followed out of research on how residual stresses influence the life of critical parts, applies regardless of what the fatigue life was before tumbling.

Other effects of tumbling may not be so useful: Parts may be harder to punch, elastic limit may be reduced, abrasive residue may complicate welding. Full report on page 98. *Please turn the page.*

THE OUTLOOK

Metalworking production has recovered almost three-fifths of its recession loss, gaged by the American Machinist Index. It will go higher as the year moves on. Capital goods orders finally have turned up after a long, lean period. Details on page 85.

METALWORKING REPORT . . .

Electrophoretic Deposits

Virtually any material, metallic or nonmetallic, can be deposited on almost any other material by the process of electrophoresis developed by Vitro Corp of America. Fields of application include the production of ceramic-clad metal structures, and the application of molybdenum coatings to steel or other metals.

The process involves immersing the work in a colloidal suspension of charged particles of the coating material in an electrostatic field. The particles migrate from one electrode, usually the tank, to the opposite electrode, the work. Deposition is extremely rapid, and a coat two mils thick is obtained in 20 sec. Thickness can be controlled to ±0.1 mil.

After coating, the work is placed in a rubber or plastic sack, from which all air is exhausted, and densified by hydrostatic pressing at 25 to 50 tsi. The densified coat may be handled without danger of removal of the coat, but sintering is required for formation of a bond. This is performed at a relatively low temperature (about 1200 C for molybdenum) and produces a bright, dense, well bonded coat with a well defined diffusion layer. An outstanding characteristic is the absolute uniformity of the coating. Screw threads, for example, may be coated with complete assurance that the thickness of coat at the root will be exactly the same as at the crest.

The process opens up a whole new field for deposition of combinations of materials, as ratio of deposit on the work surface will be exactly the same as the ratio in the bath. In some cases a metallic oxide may be deposited, and this must be reduced to the metallic form by reducing in hydrogen prior to sintering.

MATERIALS HANDLING

Handling With Magnetic Ink

A sensing system, used in conjunction with a programmer, automatically dispatches work moving along a conveyor line to specified machines or areas. Magnetic-ink identification codes (usually in binary form) are printed on sides of cartons holding material. As cartons reach each transfer point along an automatic conveyor, the sensing device accepts or rejects them individually for transfer, according to the magnetic-code marks. This requires pre-programming of each sensing device. System is being tested by General Electric.

MATERIALS & COMPONENTS

Metal-like Plastic

It's castable in conventional zinc-die-casting dies. Machinability is equivalent to screw-machine brass, requiring the same tool angles, feeds and speeds. These are only two important characteristics of DuPont's new Delrin plastic, which will be commercially available this Spring.

Said to be more like metal than any previous plastic, this material is the first of a new family of acetal resin compounds. It could easily find a larger market than nylon for various mechanical component parts.

Tensile strength of the new plastic is 10,000 psi—low for metal but very high for plastic. Melting takes place sharply at 350 F. There are practically no known solvents for Delrin, but it can be easily welded.

Refractory for 2000 F —

Silicon nitride is a new refractory material developed by Haynes Stellite Co which retains its strength above 2000 F and can be used in neutral or reducing atmospheres up to 3000 F. Outstanding resistance to molten aluminum and other nonferrous metals, plus the ability to withstand repeated thermal shock, are its outstanding qualities. Silicon nitride also resists corrosion.

MANUFACTURING CONTROL

Tape-Instructed Operators

AIMO—Audibly Instructed Manufacturing Operations—is the name of a new Dictaphone Corp system that relays taped instructions to machine operators. Here's how it works: Instructions for each operation are dictated onto a magnetic tape. The machine operator turns on a playback unit and receives instructions through an earphone. After each set of instructions, the unit stops to let the operator carry them out. When he is ready for more commands, he turns on the playback unit again.

Developed jointly with Westinghouse (*AM*—Aug 25 '58, p97), the system is now in use at Westinghouse plants in Buffalo and Pittsburgh.

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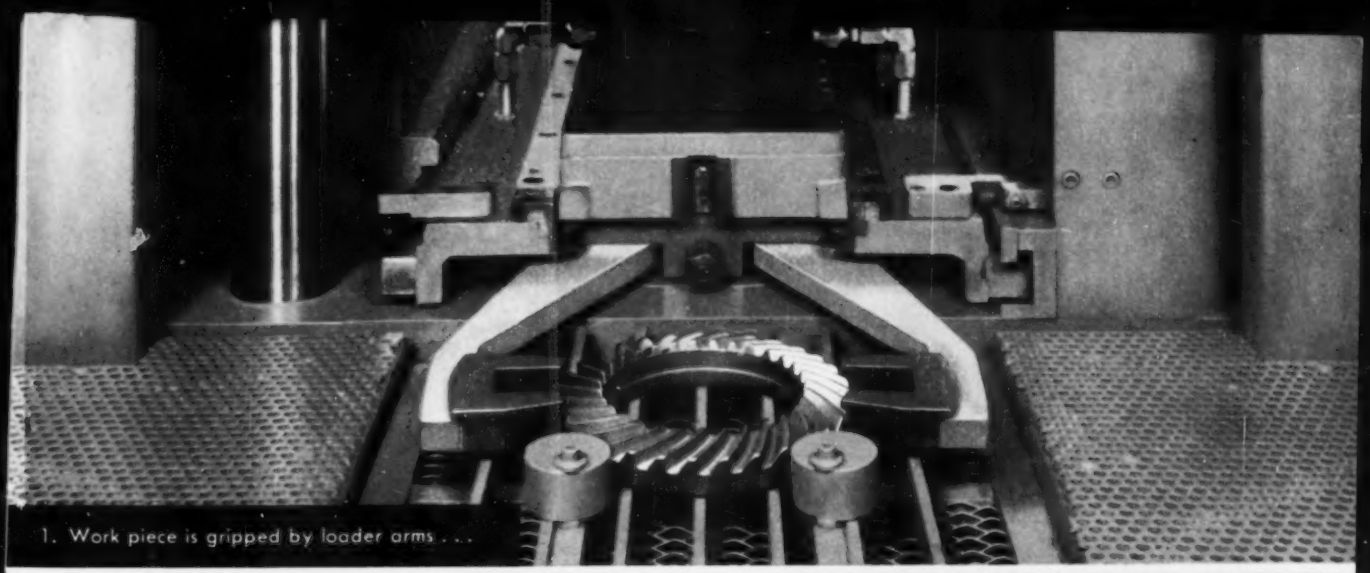
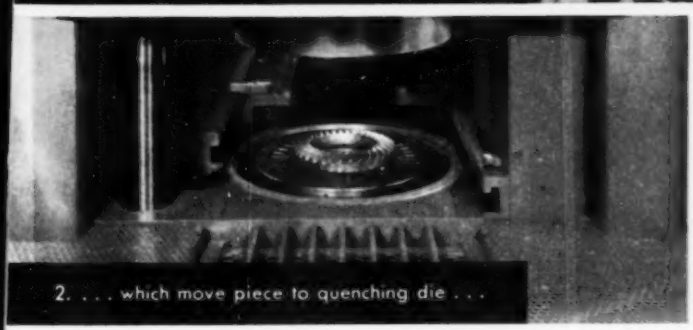
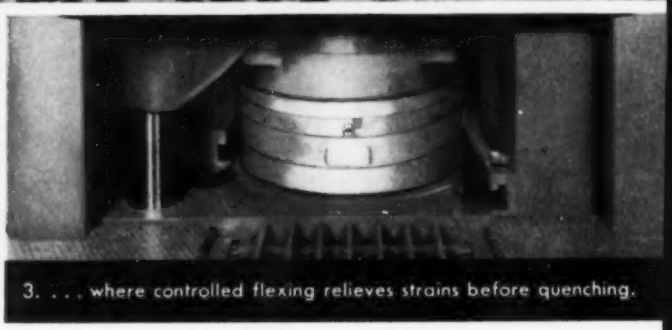


1. Work piece is gripped by loader arms . . .



2. . . . which move piece to quenching die . . .



3. . . . where controlled flexing relieves strains before quenching.

New Gleason machine quenches gears *3 times faster* with minimum distortion

The unique, fully automatic method incorporated into the new Gleason No. 117 Quenching Machine makes it possible to quench gears and other parts faster than ever before without significant distortion.

The machine discharges a piece every 30 seconds; accommodates 17 pieces in process at one time.

Automatic handling. Once a part is deposited at the front of the machine, the No. 117 positions it on a quenching die and then clamps, flexes, and quenches it. Initial quenching takes only about ten seconds.

When the part cools past the critical hardening temperature, it is released from the dies. Still immersed in oil, the part then cools completely as it travels on a conveyor to the unload chute. As soon as part is released from dies, the machine is ready to receive another work piece.

Flexing before quenching. Each hot part is flexed between the dies to relieve internal stresses. Rate and number of flexes are easily preset. Hydraulic pressure produces positive diaphragming action.

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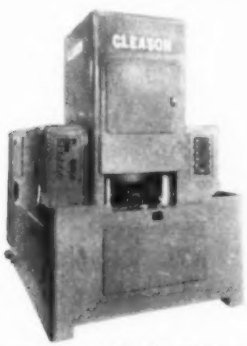
Gleason engineers are ready to help you step up productivity with this new machine. For complete details, write for bulletin.



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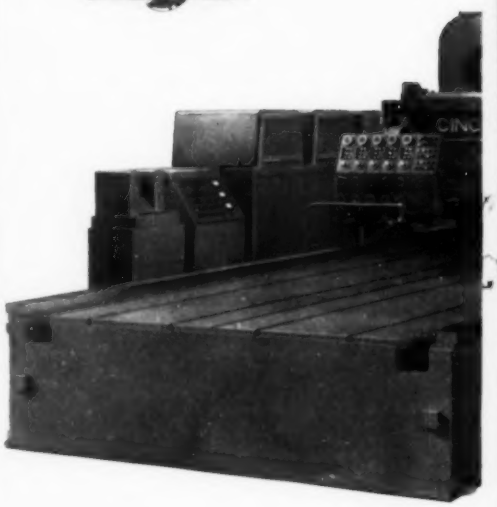

Large Numerically Controlled Milling Machine, developed and built by the Special Machine Division for the aircraft industry. An aluminum aircraft component milled on this machine is illustrated at the right. Many parts of this type are milled in 1/5 the time usually required. The machine is a gantry type, having fixed table measuring 8 ft. x 30 ft.

CINCINNATI Horizontal Hydro-Broach Machine, typical of the many designed and built for the automotive industry to broach cylinder heads and blocks. The machine illustrated broaches cylinder heads on the top, joint face and two manifold pads each cycle. The work progresses from the right- to the left-hand fixture. Ram speeds are adjustable, from 100 to 200 feet per min.; electro-mechanical drive; 300 hp. Production: 112 heads per hour.

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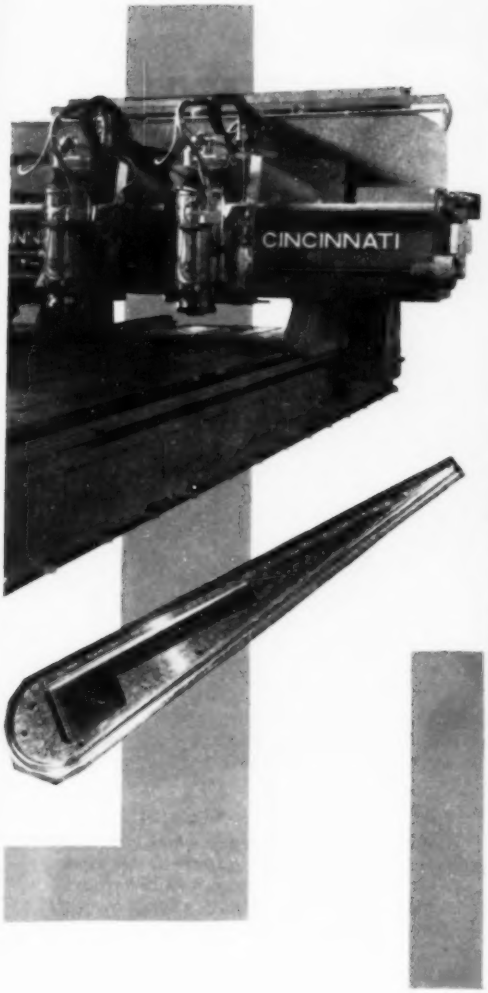
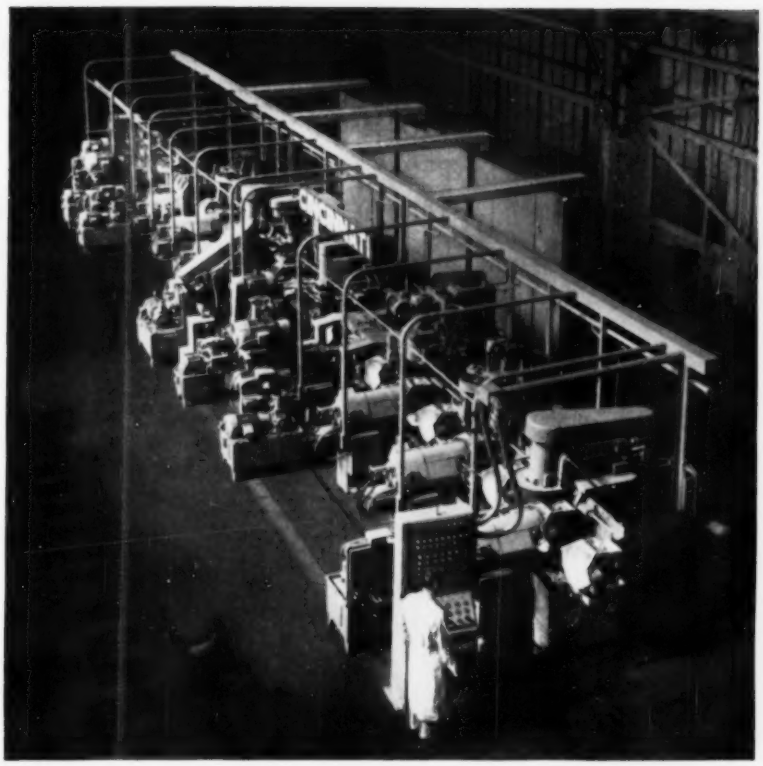
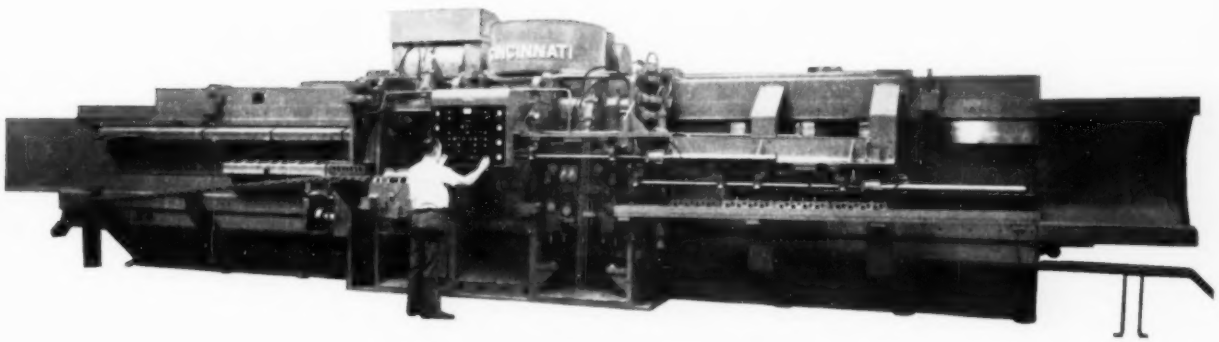




CINCINNATI 26-Station Unit Type Transfer Line. This efficient production line automatically mills, drills and bores transmission cases in 33 operations; inserts two bushings; banks excess parts; transfers the castings from one station to the next. Several noteworthy advantages are incorporated in the line, including unit construction; one station for future engineering changes; complete static electrical control. Accuracy and finish obtained are excellent. The line cycles at the rate of 137 per hour.

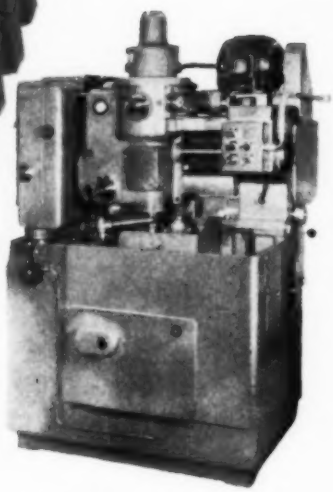


BROACHING MACHINES • COMPLETE PRODUCTION LINES

SPECIAL MACHINE DIVISION
The Cincinnati Milling Machine Co.
Cincinnati 9, Ohio

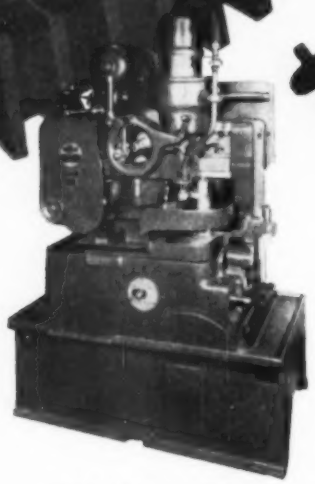
CIRCLE 173 READER SERVICE CARD

In Every Size Range ...Cut Costs with



FELLOWS NO. 4GS

Among the products for which gears are cut on the 4GS are automatic transmissions, gasoline motors, hoist and well drilling equipment, computers and aircraft reduction gear units.



FELLOWS 7A-TYPE

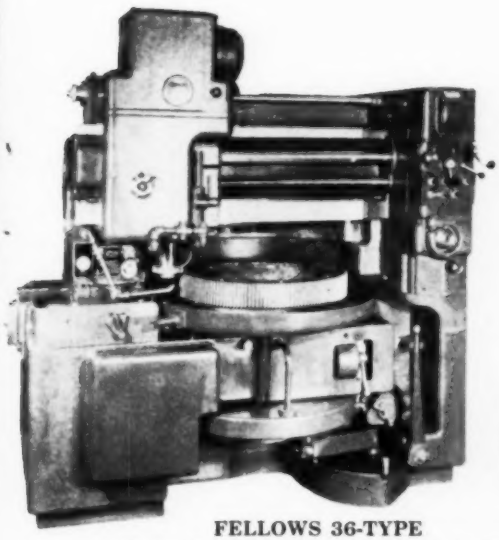
Gears cut on the 7A are used in textile machinery, servo-mechanisms, washing machines, cash registers, lawn mowers, machine tools and motorcycle engines.

FELLOWS 3-INCH FINE-PITCH

Used to cut gears for computers, bomb director and gun fire control systems, aircraft and flight control instruments, cameras and electro-mechanical mechanisms.

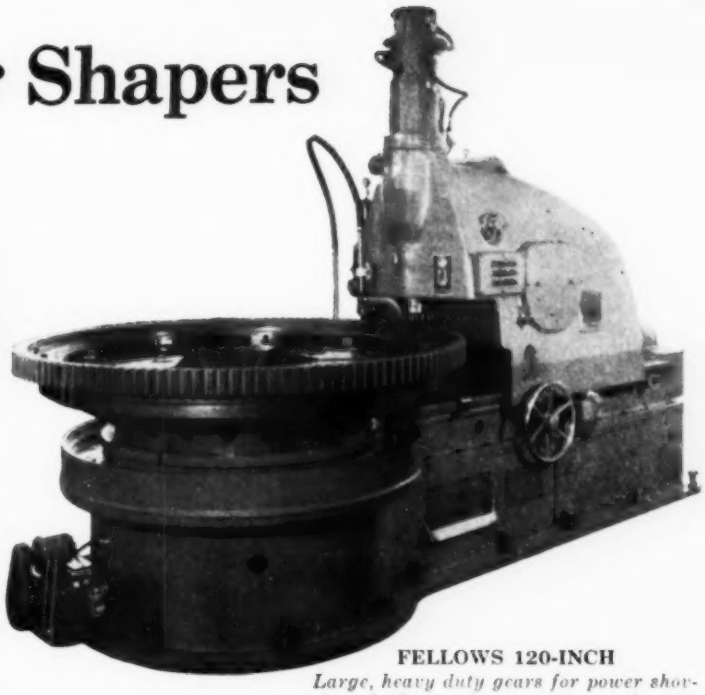
THE PRECISION LINE

Fellows Gear Shapers



FELLOWS 36-TYPE

Gears for construction equipment, textile machines, mining machinery, industrial truck transmissions, tractors, cranes and hoists are cut on this machine.



FELLOWS 120-INCH

Large, heavy duty gears for power shovels and other road construction equipment, heavy cranes, gun segments, tank turrets and winches are cut on the 120-Inch.

Modernizing cuts costs. In many plants the speed and versatility of new Fellows Gear Shapers has lowered gear production costs by more than a third and repaid the investment in just a few years.

Gear Shapers are ideal for many non-involute shapes too, such as internal and external splines, cams, clutches and nearly every other conceivable shape. Modifications to the Gear Shaper permit rapid, economical production of oval or elliptical gears. Fellows machines are available for either full- or semi-automatic operation for high speed, long-run production with a minimum of operator attention.

Your Fellows representative can show you where and how new machines from Fellows' Precision Line can lower your costs for small lots as well as for long production runs. Ask him for the facts.

THE FELLOWS GEAR SHAPER COMPANY
78 River Street, Springfield, Vermont
Branch Offices: 1048 North Woodward Ave., Royal Oak, Mich.
150 West Pleasant Ave., Maywood, N. J.
5835 West North Avenue, Chicago 39
6214 West Manchester Ave., Los Angeles 45

Fellows *Gear Production Equipment*

WHY is chaser hardening important to your threads?

When cutting your threads—long tool life, maximum accuracy, and trouble-free operation can only be assured by proper chaser hardening.

Proper chaser-hardening technique is an important intangible offered you by LANDIS Threading Specialists. For example, LANDIS Tangential Chasers are often given special hardening treatment when workpiece design or material specifications so indicate. Just as with the blacksmith of years gone by, so chaser hardening today is an art. The ability to determine and apply the proper chaser-hardening technique is the result of more than 50 years experience in a single field—THREADING.

Yet—chaser hardening is but one benefit of the extensive technical knowledge and practical experience accumulated through years of specialization. Recommendation on unusual tooling set-ups, automation, new methods, the most efficient type of threading equipment are a few of the many ways in which LANDIS Threading Specialists may be of help.

Whatever your need for generating threads —Cutting, Rolling, Grinding, or Tapping— LANDIS Threading Equipment will accomplish it most efficiently and economically.

When asking about threading information please send specifications.

Threading Machines

LANDIS *Machine* COMPANY

THE WORLD'S LARGEST MANUFACTURER OF THREADING EQUIPMENT

WAYNESBORO, PENNSYLVANIA

Die Heads—Rotary & Stationary

Thread Rolling Machines

Thread Rolling Tools

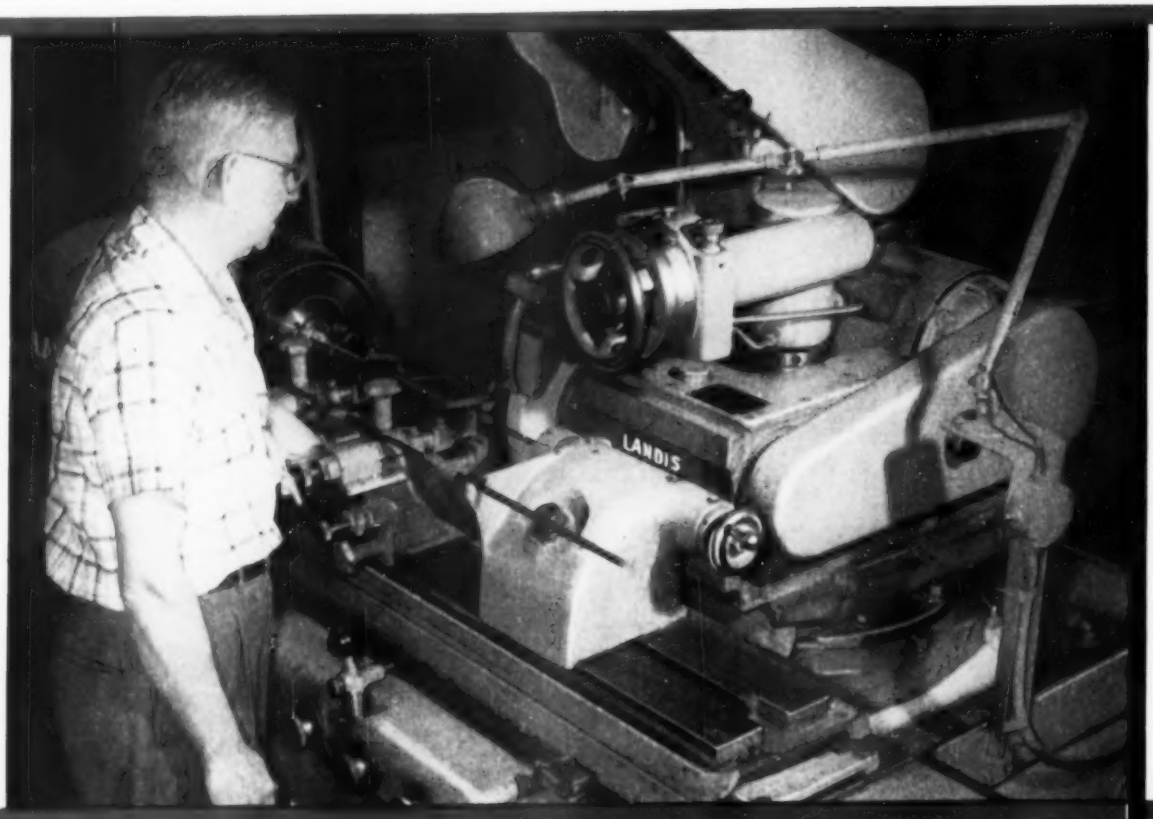
Centerless Thread Grinding Machines

Taps—Collapsible & Solid Adjustable

535C

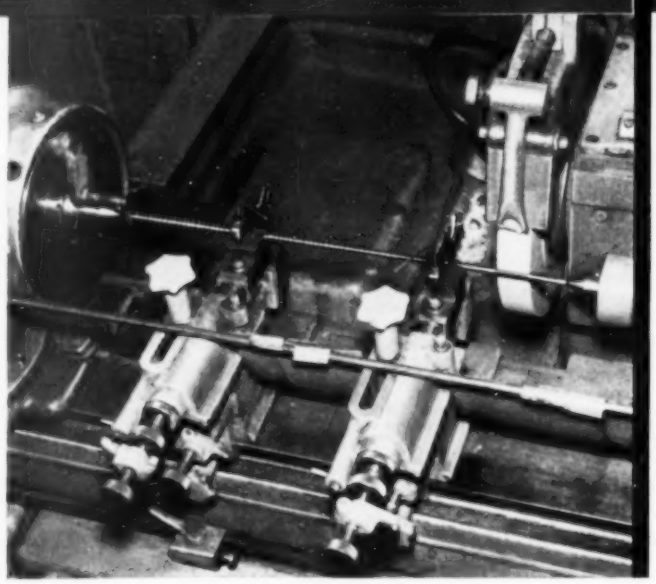
CIRCLE 176 READER SERVICE CARD

Landis universals demonstrate versatility



A well known manufacturer of automotive electrical components uses this Landis 12" x 36" Type CH Universal grinder in their toolroom. This shows one of the many jobs ground on this machine.

Broken broach repaired by grinding welded new shank to match the original shank. Work rests support the long, slender workpiece.



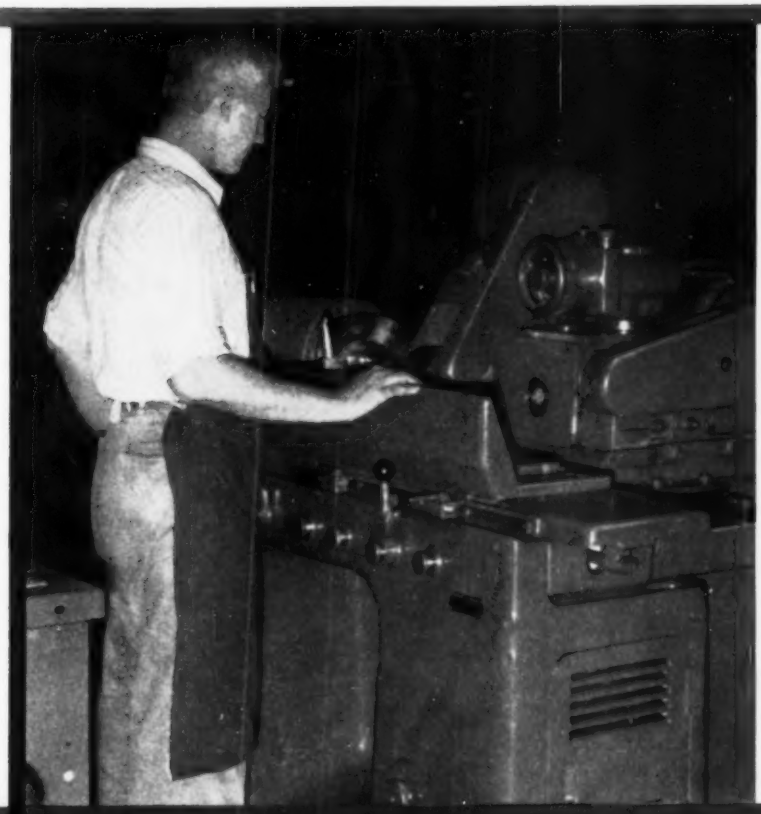
LANDIS

precision grinders

LANDIS TOOL COMPANY

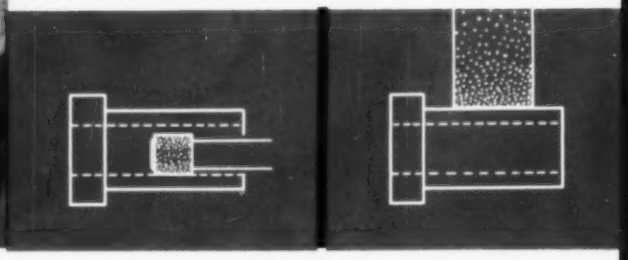
CIRCLE 178 READER SERVICE CARD

in profitable grinding operations



A west coast machinery manufacturer uses his Landis 10'' x 20'' Type H Universal to grind a wide variety of parts in small lots. Where set-ups are frequent, the convenience and flexibility of this Landis Universal saves time and raises production considerably.

Cycle time cut in half—grinding the I.D. and O.D. in one chucking. Drill bushings are shown here being ground to .0005'' tolerance with .015'' to .020'' stock removal. This operation was formerly done on an engine lathe with a grinding attachment.



WAYNESBORO, PENNSYLVANIA

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. . . and now still Another

MORSE "FIRST"

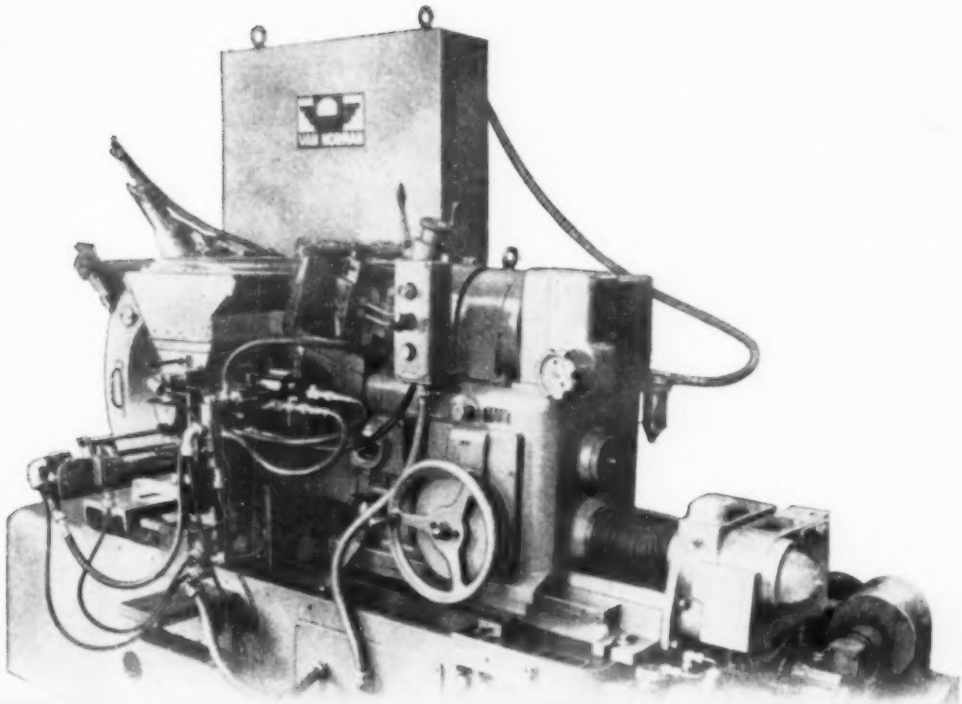
Quality Precision Grinding stepped VAN NORMAN Centerless Grinder

Ever since Stephen Morse produced the first twist drill, Morse has been the leader of progress in cutting-tool production methods.

Electrolizing . . . Vectormatic Taps . . . Morse's flute-grinding process . . . these are some of the Morse milestones in supplying better and better cutting tools to industry.

Now here's another step ahead . . . centerless grinding of drills on this new high-precision, high-production Van Norman Diversimatic machine, specially adapted to Morse requirements.

To *you*, this means *new high standards* of uniform quality and prompt delivery. See your Morse-Franchised Distributor *today*.



up with this NEW

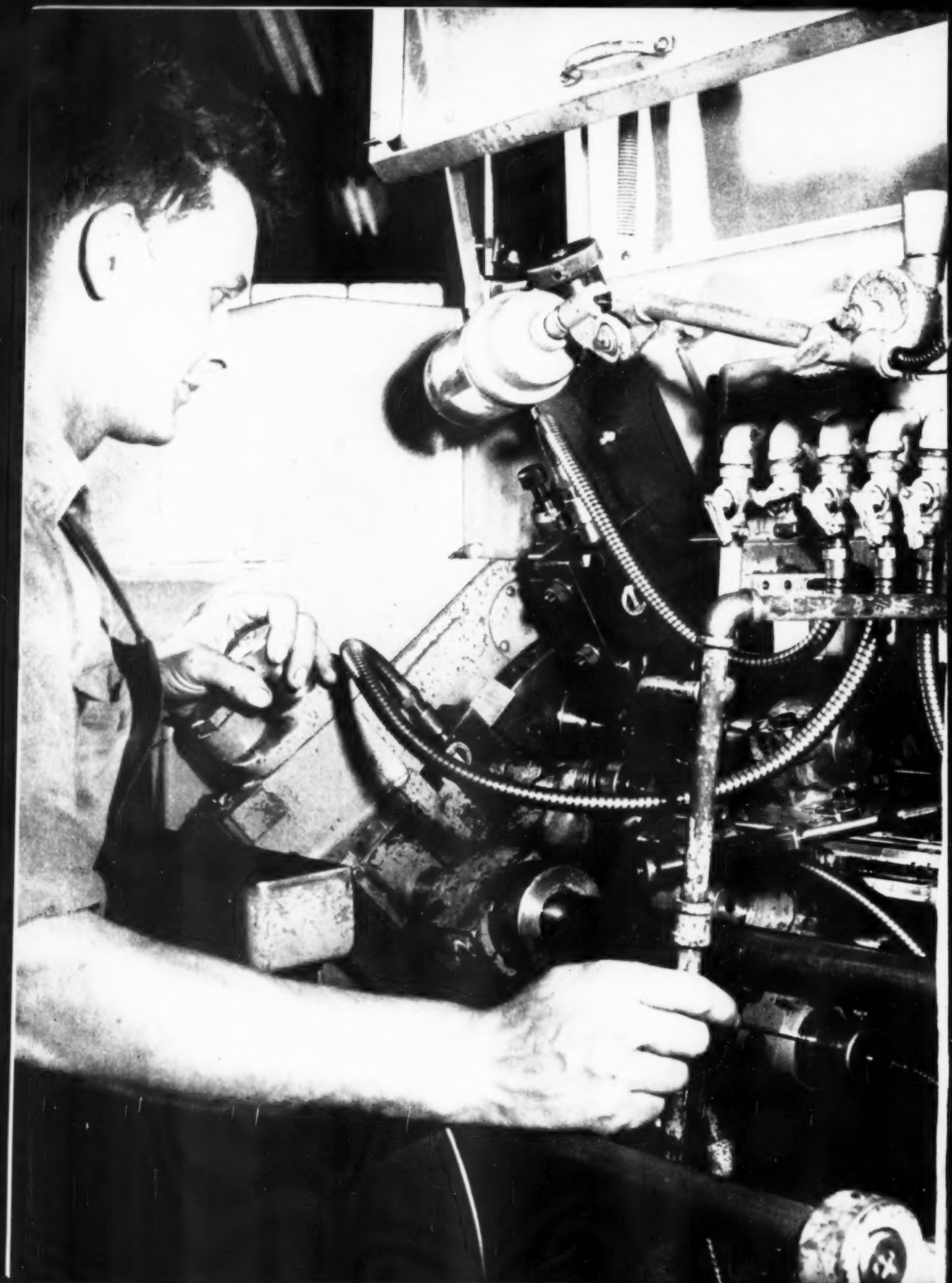
means
in Cutting Tools

MORSE TWIST DRILL & MACHINE CO., NEW BEDFORD, MASS.

Warehouses in: New York • Chicago • Detroit • Dallas • San Francisco

Division of VAN NORMAN INDUSTRIES, INC.

CIRCLE 181 READER SERVICE CARD



"Our Warner & Swasey 5-Spindle Automatics put us in business on small lot precision jobbing work..."

REPORTS **TROY MANUFACTURING CO.** WELSHFIELD, OHIO

Success of this progressive 6-man job shop has literally been founded on the ability of their 2¼-inch 5-Spindle Warner & Swasey Automatics to produce complex work accurately, in lots as small as 500 pieces with simple tooling and fast setups.

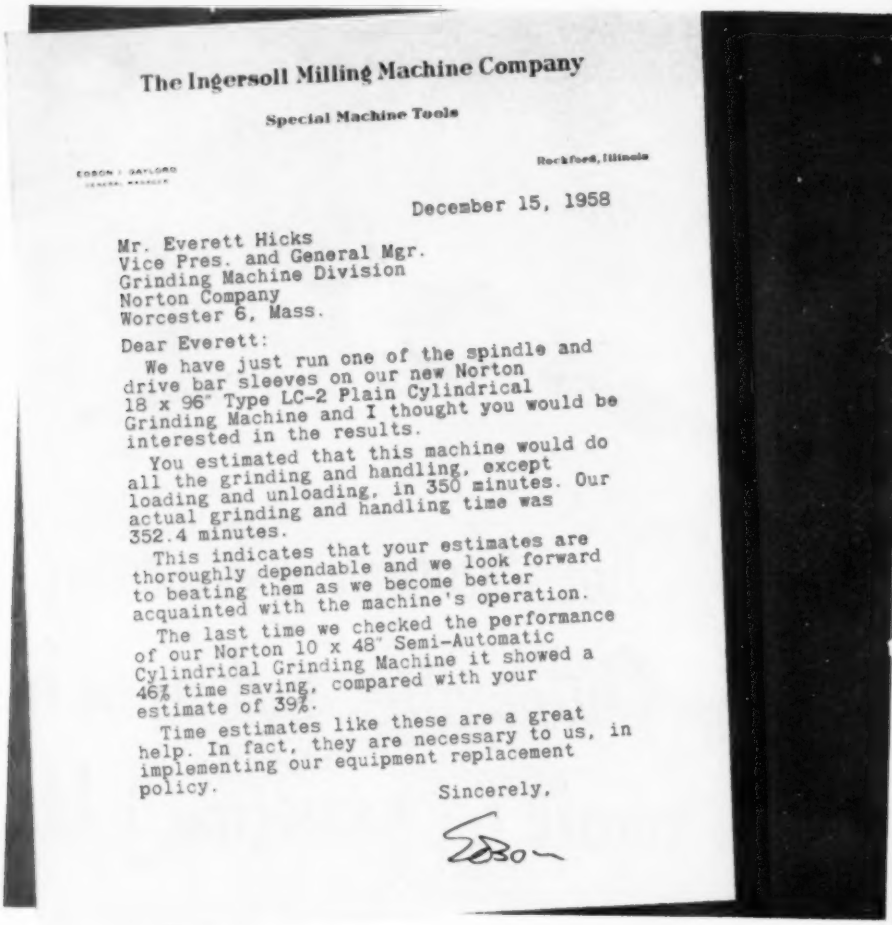
Generally accepted job shop practice precludes the use of multi-spindle operations because of the economics involved in the "set-up time—lot size" relationship. This ratio is usually quite large on conventional automatics—which eliminates them from all but the longest run jobs.

However, Troy Mfg. has found the reverse to be true in the operation of their two Warner & Swasey 5-Spindle Automatics. As Mr. Cseplo, Manager of Troy Mfg., explained, "Quick set-ups permit us to profitably handle small lot work, and on jobs requiring tolerances between .001" and .002" we seldom scrap a piece which I think is good multi-spindle work. We handle an extreme range of work size and materials in short runs, and the accuracy and versatility of our Warner & Swaseys are invaluable assets to a job shop operator."

Warner & Swasey Multi-Spindle Automatics can substantially cut your machining costs on small and medium lot production—as well as on longer runs. To get the complete story of how these versatile machines can profitably fit into your production picture, call in your Warner & Swasey Field Representative, today.

YOU CAN PRODUCE IT BETTER, FASTER, FOR LESS . . . WITH A WARNER & SWASEY

WARNER & SWASEY
Cleveland
PRECISION MACHINERY SINCE 1880



The Ingersoll Milling Machine Company

Special Machine Tools

Rockford, Illinois

December 15, 1958

Mr. Everett Hicks
Vice Pres. and General Mgr.
Grinding Machine Division
Norton Company
Worcester 6, Mass.

Dear Everett:

We have just run one of the spindle and drive bar sleeves on our new Norton 18 x 96" Type LC-2 Plain Cylindrical Grinding Machine and I thought you would be interested in the results.

You estimated that this machine would do all the grinding and handling, except loading and unloading, in 350 minutes. Our actual grinding and handling time was 352.4 minutes.

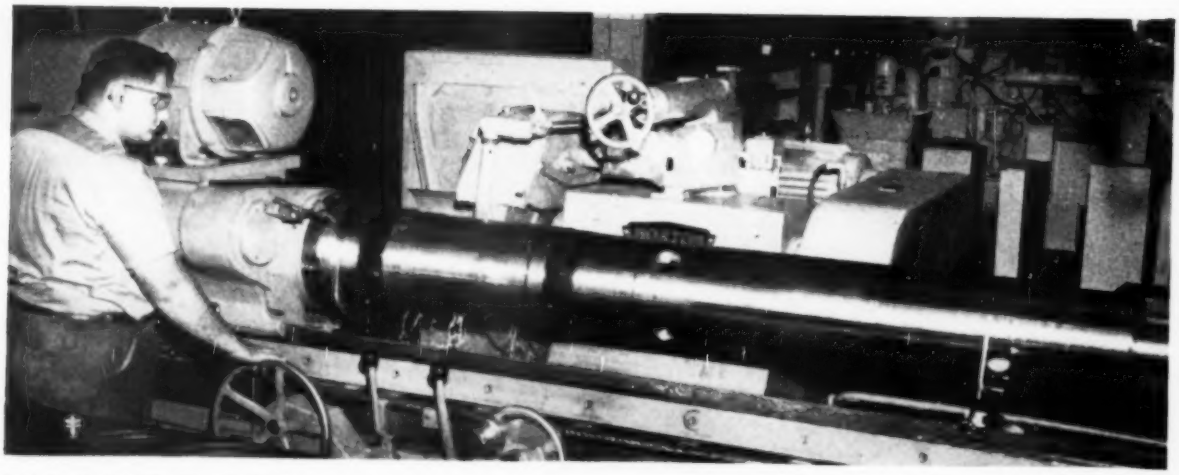
This indicates that your estimates are thoroughly dependable and we look forward to beating them as we become better acquainted with the machine's operation.

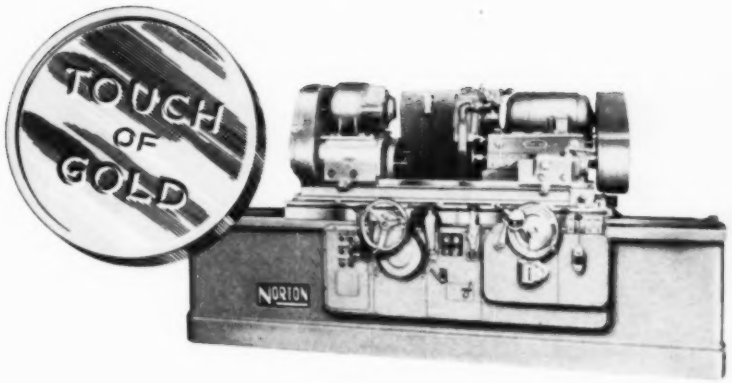
The last time we checked the performance of our Norton 10 x 48" Semi-Automatic Cylindrical Grinding Machine it showed a 46% time saving, compared with your estimate of 39%.

Time estimates like these are a great help. In fact, they are necessary to us, in implementing our equipment replacement policy.

Sincerely,

Ingersoll reports how Norton Cylindrical Grinders save





As Mr. Gaylord, the Ingersoll Milling Machine Company's General Manager, points out, Norton machines will give you increased production.

This increased production is just one of the proved "Touch of Gold" advantages of Norton grinding machines. Others are precise sizing control, low maintenance and long, continuous service life. These are designed into each machine.

Norton Cylindrical Grinders have swing capacities ranging from 4″ to 24″ and work lengths from 18″ to 168″. All are available as Plain Machines or Semiautomatics. All have controls for feeds and speeds grouped at the operating position, with key maintenance points located outside. And all are engineered for adaptability to meet changing production requirements, and for durability to keep on delivering economy under the toughest conditions of use.

Call in your Norton Sales Engineer, a well trained, long experienced specialist in grinding. He'll gladly give you an accurate estimate of what Norton grinding machines can do for you. NORTON COMPANY, Machine Division, Worcester 6, Mass. District Offices: Worcester, Hartford, Cleveland, Chicago, Detroit. In Canada: J. H. Ryder Machinery Co., Ltd., Toronto 5.

as predicted

Photos show the types of cylindrical grinders used and described by the Ingersoll Company. Photo at upper right is a Norton 10″ x 48″ Type CTU; photo at left was taken in the Ingersoll plant, and shows their Norton 18″ x 96″ Type LC-2.

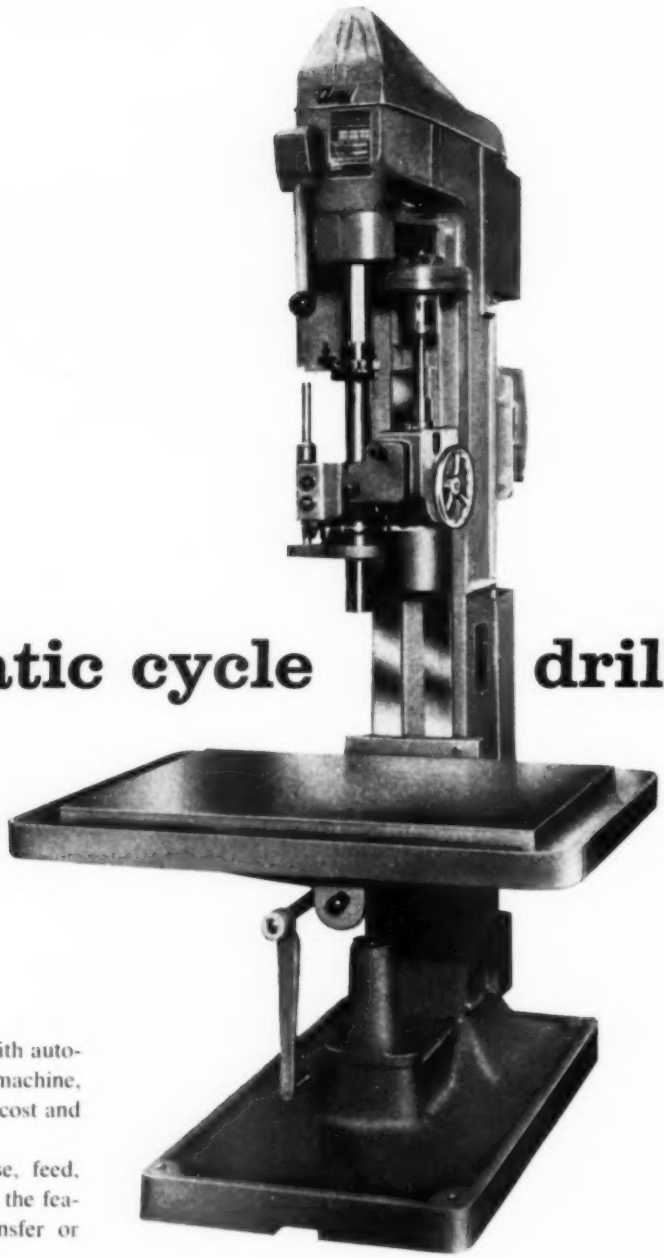
NORTON

GRINDERS and LAPPERS

Making better products
...to make your products better

NORTON PRODUCTS Abrasives • Grinding Wheels • Grinding Machines • Refractories • Electrochemicals — **BEHR-MANNING DIVISION** Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

automatic cycle drilling



■ You can chop your time costs with automatic set-ups on this new Avey machine, and still take advantage of the low cost and flexibility of a standard unit.

Adjustable rapid power traverse, feed, and rapid return of the spindle are the features which permit automatic transfer or rotary index fixturing.

At the same time, you get adjustable feeds, speeds, table travel, head travel, and Avey's advanced spindle construction.

The machine is available with No. 2, 3, and 4 Morse Taper; 1 to 3 HP motors; single or multiple spindles. Your request for additional information will be promptly answered. Avey Division, The Motch & Merryweather Machinery Co., P. O. Box 1264, Cincinnati 1, Ohio.

■ For help in cutting the cost of your drilling operations, call one of these competent distributors near you:
Asheville: Tidewater Supply Co.
Atlanta: R. O. Deaderick Co.
Birmingham: McVoy-Hausman Co.
Boston: Rudel Machinery Co., Inc.
Buffalo: Rudel Machinery Co., C. H. Briggs Division
Charlotte: Tidewater Supply Co.
Chattanooga: R. O. Deaderick Co.
Chicago: Marshall & Huschart Machinery Co.
Cincinnati: Motch & Merryweather Machinery Co.
Cleveland: Motch & Merryweather Machinery Co.
Columbia: Tidewater Supply Co.
Dallas: Briggs-Weaver Machinery Co.
Dayton: Motch & Merryweather Machinery Co.
Denver: Geoffroy Lane, Inc.
Detroit: Motch & Merryweather Machinery Co.
Ft. Lauderdale: Southeast Machinery Co.
Houston: Oliver H. Van Horn Co., Inc.
Indianapolis: State Machinery Co.
Kansas City: Blackman & Nuetzel Machinery Co.

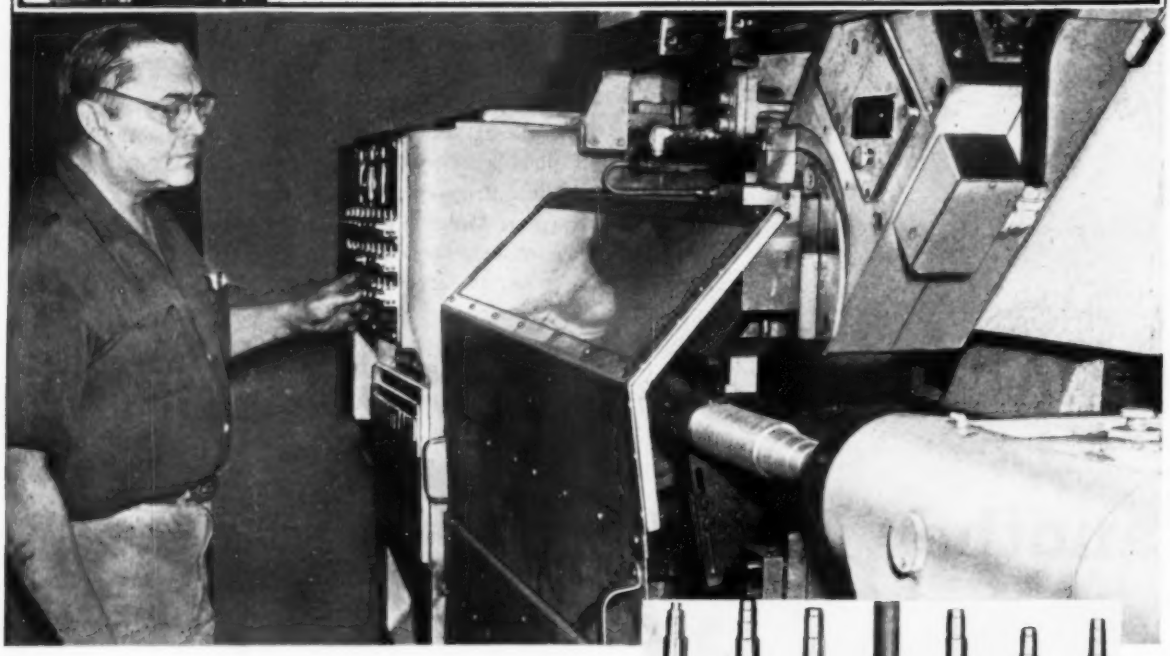
another first by Avey

Knoxville: R. O. Deaderick Co.
Los Angeles: Tornquist Machinery Co.
Milwaukee: Marshall & Huschart Machinery Co.
Minneapolis: The Satterlee Co.
Montreal: Rudel Machinery Co., Ltd.
New Orleans: Frederick & Baker Co.
New York: Rudel Machinery Co., Inc.
Norfolk: Tidewater Supply Co.
Philadelphia: W. E. Shipley Machinery Co.
Phoenix: Southwest Machine Tool Co.
Pittsburgh: Motch & Merryweather Machinery Co.
Portland: Halladie Machinery Co.
Roanoke: Tidewater Supply Co.
Rochester: Rudel Machinery Co., C. H. Briggs Division
Rockford: Marshall & Huschart Machinery Co.
Rock Island: Marshall & Huschart Machinery Co.
San Francisco: Harron, Rickard & McCone Co.
Seattle: Halladie Machinery Co.
Shreveport: Frederick & Baker Co.
South Bend: Marshall & Huschart Machinery Co.
St. Louis: Blackman & Nuetzel Machinery Co.
Syracuse: Rudel Machinery Co., C. H. Briggs Division
Toronto: Rudel Machinery Co., Ltd.
Vancouver: Rudel Machinery Co., Ltd.
Washington: W. E. Shipley Machinery Co.
West Hartford: Rudel Machinery Co., Inc.
Windsor: Rudel Machinery Co., Ltd.

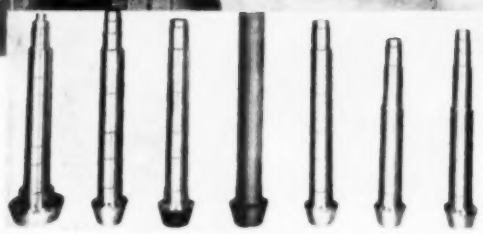
CIRCLE 187 READER SERVICE CARD

SUNDSTRAND

"ENGINEERED PRODUCTION" NEWS



Tracer Turning of Bevel Pinion Shafts



Slashes Setup Time, Cuts Costs, Improves Finish

A combination of faster setups and reduced machining times enables one Sundstrand automatic tracer lathe to replace two machines formerly required for turning five sizes of tractor bevel pinion shafts. Increased production, reduced set up time, closer tolerances, simplified operation, reduced costs, and finer finishes are the benefits of this change to Sundstrand.

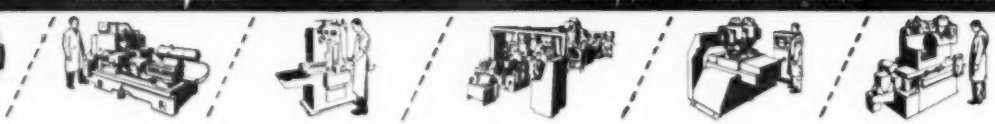
Changeover time was reduced from an average of 8 hours to 1 hour on the multiple small lots turned on this lathe. Rough forgings are ruff and finish turned in one set up using an automatic indexing tool turret equipped with a ruff and finishing tool. Finishes were improved 50% over previous machining method and tolerances are consistently held within the specified limits to eliminate rework.

Parts are loaded manually and clamped with an air operated chuck and tail-stock. Completely automatic operation is push-button actuated and the machine can be set up to provide up to four cutting cycles.

Chip disposal doesn't present any problem despite a high rate of metal removal because the machine has a large open chip chute and is equipped with automatic chip disposal.

AUTOMATIC LATHES | RIGIDMILS | SPECIAL MACHINES | DRILLING MACHINES | GRINDERS

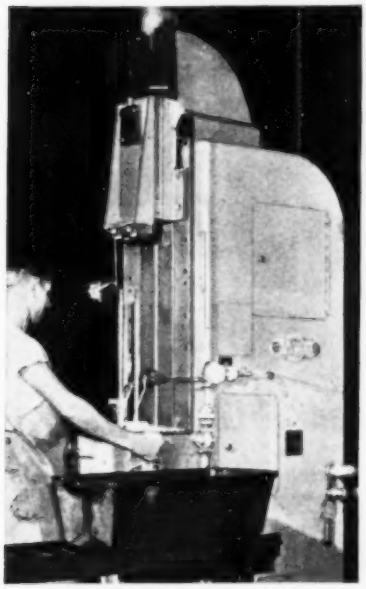
SUNDSTRAND



Versatility and Dependability Keynote Broach Performance

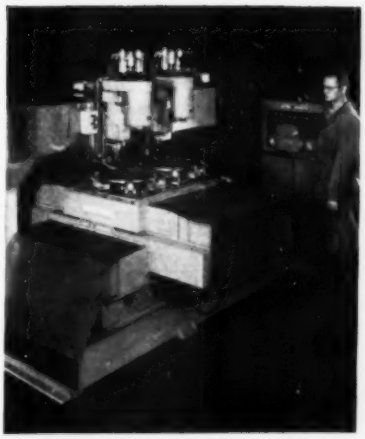
More than 15 types of automotive, mining, industrial, and electrical equipment parts are broached on four American Broach machines at this Midwestern forging plant. Quick changeover and long broach life are as important as precision in making this a highly successful installation.

Properly designed broaching tools permit part tolerances to be maintained during long production runs with minimum resharpening. This partnership between tools and machines — adding the right fixturing where required — is the only sure way to provide top performance on every broaching job.



American three-way machine can be used for push, pull or surface broaching.

Typical parts broached by one customer on Sundstrand - American machines.



Tape-controlled positioning table permits precision hole drilling on two parts at a time.

Tape Control Simplifies Multiple Hole Drilling

Precision doesn't have to be expensive — this fact is proved by applying Sundstrand "Engineered Production" to this multiple hole drilling job. The special drilling machine is designed around Sundstrand's Jigmatic tape-controlled positioning table and uses drilling heads with minimum center distance requirements.

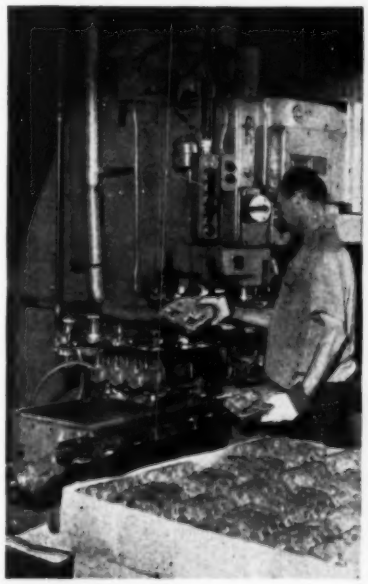
Two parts are drilled at a time without requiring expensive fixturing, lengthy setup times, or special operator skills. All the operator does is load and unload parts while the punched tape and electronically controlled table handle the actual drilling operations.

Considerable flexibility is inherent in the design. Other parts of similar size can be drilled by merely changing tapes. In addition, drill heads can be repositioned readily.

Rigidmil Triples Production on Close Tolerance Job

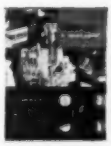
Tripling production per eight-hour shift — from 365 cylinder heads formerly to 1125 now — is the record of this Sundstrand Rigidmil. Not only is production of the aluminum alloy parts increased substantially, but also the parts are machined to a .0002-inch tolerance.

Extreme simplicity of operation, ability to load one part while another is milled, and exceptional machine rigidity all play equally important parts in attaining production records like this one. Sundstrand builds an extremely broad range of standard machines and backs them up further with semi-standards and specials, where required. This complete line, together with Sundstrand's unmatched production milling experience, is your assurance of getting the best milling machine for the job.



Two workholders with hydraulic clamping permit loading one part while another is being machined.

Additional Information on the broad line of Sundstrand machine tools is available in Bulletin 200 Write for free copy today.



BROACHING TOOLS BROACHING MACHINES PRESSES

SUNDSTRAND
MACHINE TOOL CO.
2533 Eleventh St. • Rockford, Ill., U.S.A.

3 OR 30,000 PIECES

Cut them off MORE ACCURATELY at LOWER COST and FASTER on a MARVEL Hack Saw

1. Accuracy? 2. Speed? 3. Low Cost?

Which is most important in your production or intermittent cutting-off operations? *You get all 3* when your work is handled on a MARVEL Series 6A or 9A Heavy Duty Ball Bearing Hack Saw. Whether you're cutting 3 or 30,000 identical pieces, you can be certain that each piece will be true . . . that it will be cut-off quickly, and at the lowest possible tool cost

MARVEL Hack Saws are fine machine tools, with all the built-in accuracy this description implies. Designed to operate at higher speeds, with the heaviest feed pressures, they have almost unlimited power and stamina to stand up to the most severe service.

MARVEL Hack Saws are truly multi-purpose cutting-off machines. *No* run is too short or too long, *no* material too mild or too tough to be accurately and efficiently cut-off on a MARVEL Hack Saw.

Catalog C85 has complete details, facts and figures on both Marvel metal cutting Hack Saws and Band Saws. Write for it today.

S-1306

ARMSTRONG-BLUM MFG. CO.
5700 BLOOMINGDALE AVE. • CHICAGO 39, ILLINOIS

MARVEL Metal Cutting SAWS
Better Machines–Better Blades

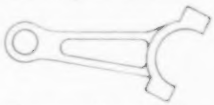
Gardner 2V18 demonstrates versatility in grinding wide variety of small precision parts

Two parallel surfaces precision ground in one operation

Counter pinion
2400 per hour

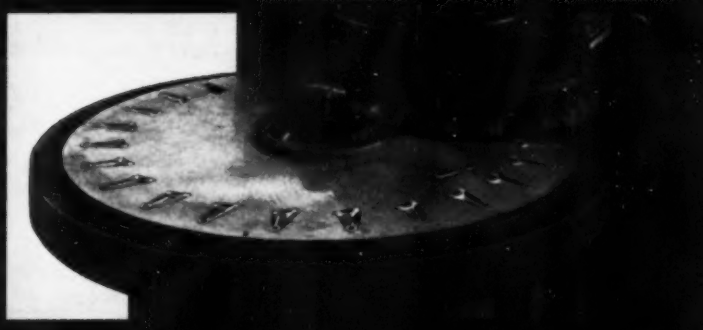
Upper and lower pole pieces
250 per hour

Watch disc
4000 per hour



Connecting rod
900 per hour

Gardner 2V18 Double Vertical Spindle Grinders lower costs with fast, accurate grinding. Interchangeable work carriers for parts of many shapes, assure profitable, flexible operation. Write for latest catalog.



Rotary work carrier assures high production grinding of both sides of small connecting rods.

GARDNER

precision disc grinders

BELOIT, WISCONSIN

There's nothing on the market like this amazing new machine,

called the LAPOINTE

AUTOMATIC HOLE POSITIONER

. . . which indexes accurately to ± 3 seconds of arc!

We took our 30"-table Rotomatic Positioner and adapted it to a precision jig boring head, with the result that holes can now be bored anywhere from center to the outside of the table within three seconds of arc of true position . . . *guaranteed!* It will repeat within one second of arc.

Such accuracy has never before been available! Consider also these critical features: Vertical trueness of spindle center line is .0005" per foot • Squareness of table top with spindle center line checked with 15-inch sweep of tram within .0005" TIR • Vertical trueness of spindle slide is within .0005" per foot • Travel of table center coincides with spindle center within .0005" in 18 inches travel • Spindle runout is within .0001" TIR.

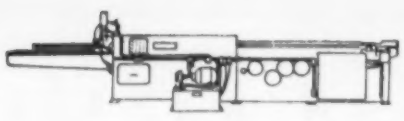
"Made to order" for any manufacturer producing parts with holes equally spaced on any bolt circle, you can judge for yourself how valuable the Lapointe Automatic Hole Positioner can be in your plant. If you are interested in having complete details, write for our new illustrated technical **Bulletin AHP**.

THE LAPOINTE MACHINE TOOL COMPANY

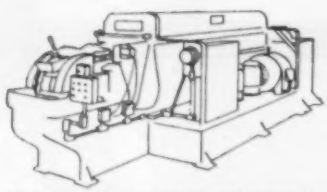
HUDSON, MASSACHUSETTS • U.S.A. *In England: Watford, Hertfordshire*

THE WORLD'S OLDEST AND LARGEST MANUFACTURERS OF BROACHING MACHINES AND BROACHES

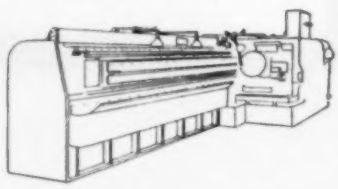
Lapointe-built Broaching Machines are available in hydraulic and electro-mechanical drives.



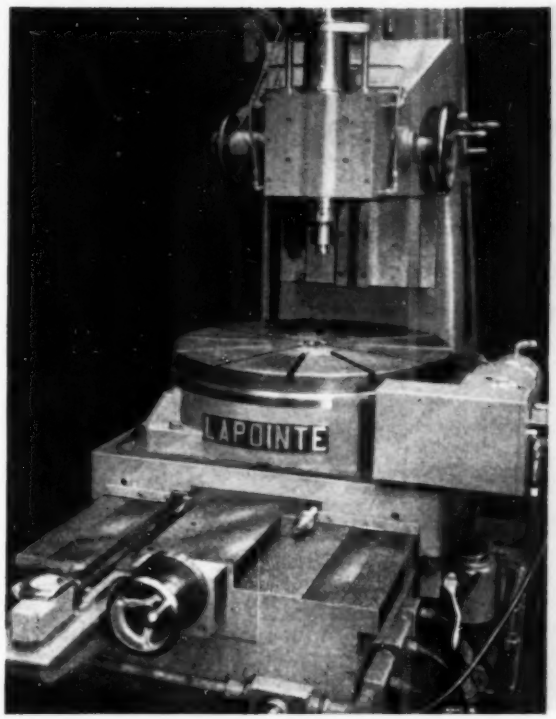
60" STROKE HORIZONTAL, ELECTRIC



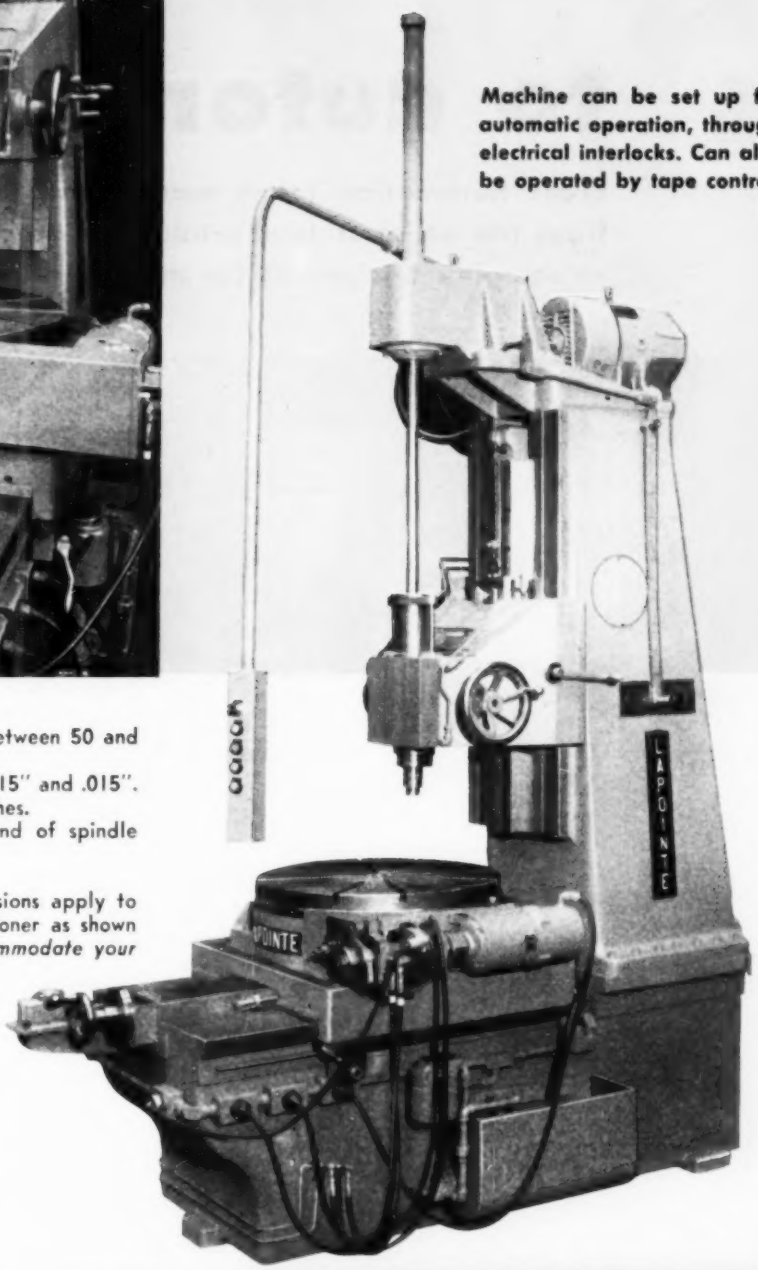
CH CONTINUOUS BROACHING, ELECTRIC



SRHE SINGLE RAM HORIZONTAL, ELECTRIC

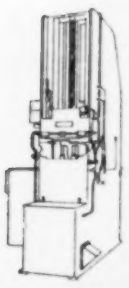


Machine can be set up for automatic operation, through electrical interlocks. Can also be operated by tape control.

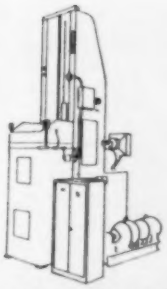


Other details:

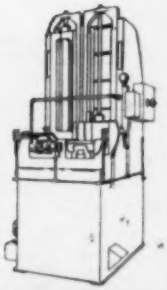
Spindle speed: infinitely variable between 50 and 2000 RPM.
Feed: infinitely variable between .0015" and .015".
Longitudinal travel of table: 18 inches.
Maximum distance, table top to end of spindle nose: 30 inches.
Net weight: 12,500 pounds.
Although these features and dimensions apply to the Lapointe Automatic Hole Positioner as shown here, *they can be changed to accommodate your own requirements.*



VUE-7 VERTICAL PULL-UP ELECTRIC



SRVE SINGLE RAM VERTICAL, ELECTRIC



DRVE DOUBLE RAM VERTICAL, ELECTRIC

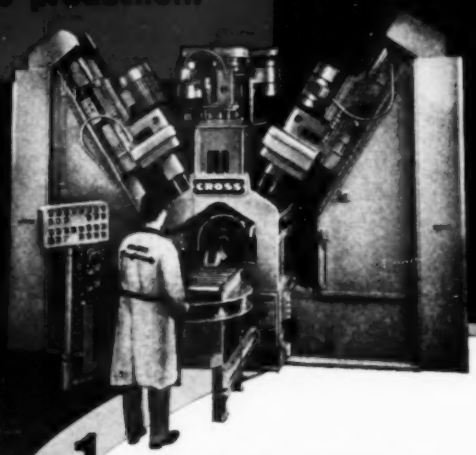
LAPOINTE

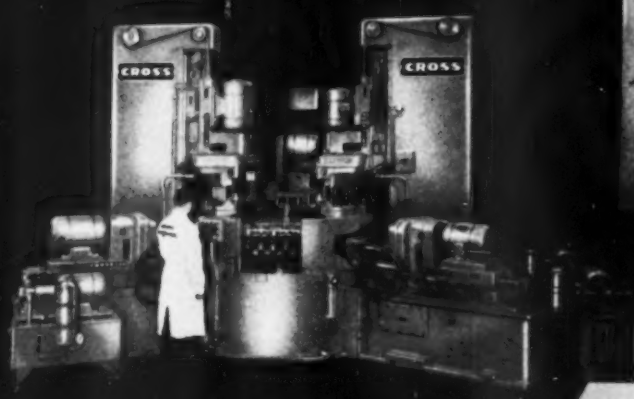
known to be the best in

BROACHING

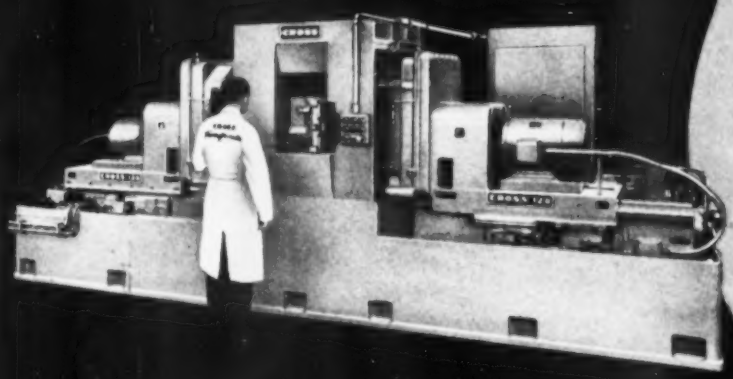
6 ways to automate

Cross automation takes many forms . . . from the simplest low production machines to complex equipment for mass production.





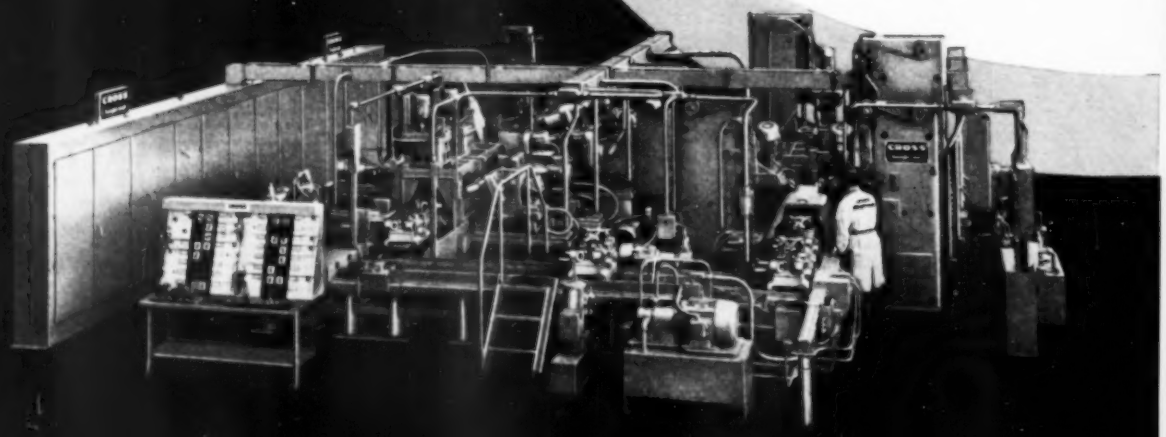
1 **CROSS SINGLE STATION MACHINES** exist in many configurations to combine operations.

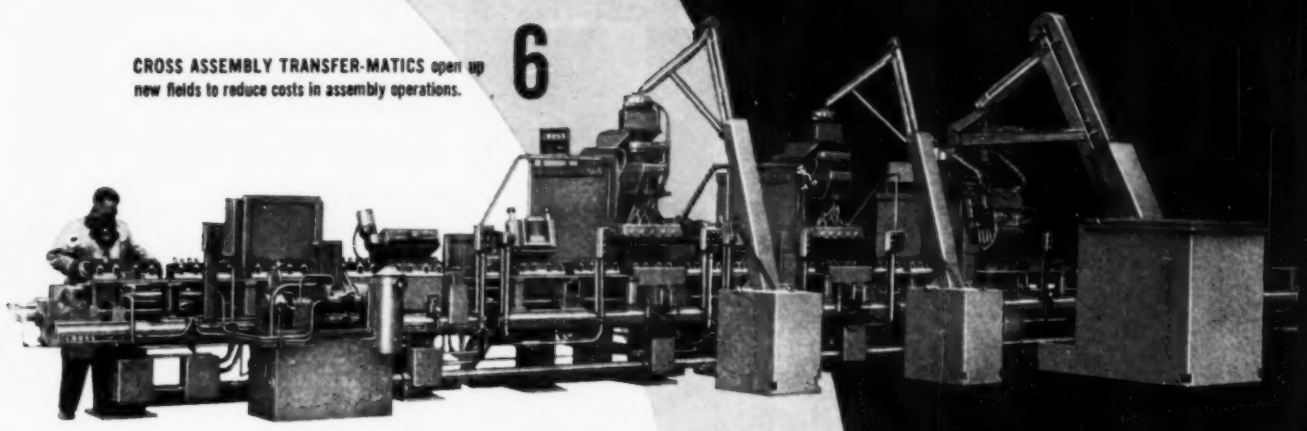


2 **CROSS DIAL TYPE MACHINES** provide multiple station performance with minimum floor space.

3 **CROSS TRUNNION TYPE MACHINES** are compact multiple station units that permit operations on opposite sides of the part.

4 **CROSS PALLET TYPE TRANSFER-MATICS** provide capacity for combining a large number of operations. Standard pallet fixtures handle irregularly shaped parts with maximum flexibility.





CROSS ASSEMBLY TRANSFER-MATICS open up new fields to reduce costs in assembly operations. **6**

The six machine types illustrated here were created by Cross to apply the principles of automation to a wide variety of metalworking operations. Thus, Cross makes available the benefits of automation to small or large manufacturers, regardless of required production volume.

Cross sales engineers are available to discuss your automation problems with you. They will also be glad to discuss the new Cross Process Development Service created to solve *unusual* automation problems—in or out of the metalworking field.

CROSS SECTIONIZED TRANSFER-MATICS provide a means of combining unlimited numbers of operations. Automatic in-process work storage minimizes downtime and increases operating efficiency. **5**

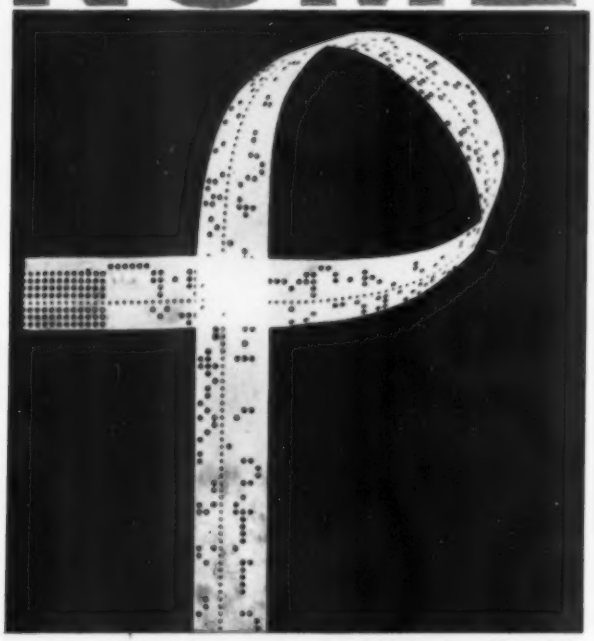
Established 1898

THE CROSS CO.

First in Automation

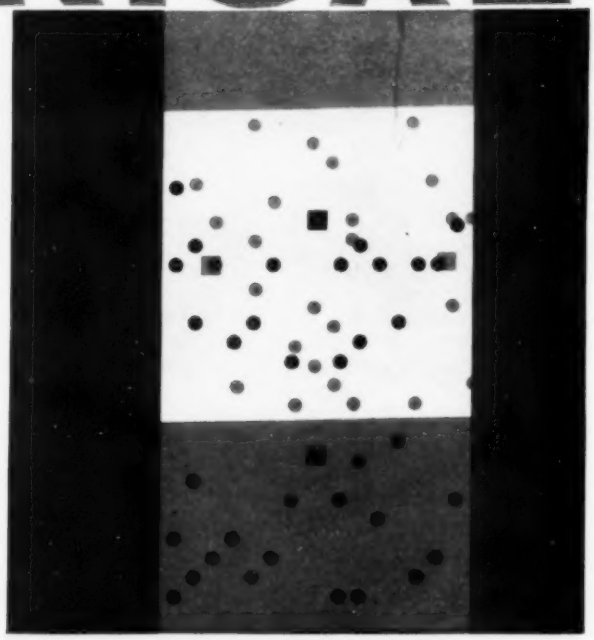
PARK GROVE STATION • DETROIT 5, MICHIGAN

NUMERICAL



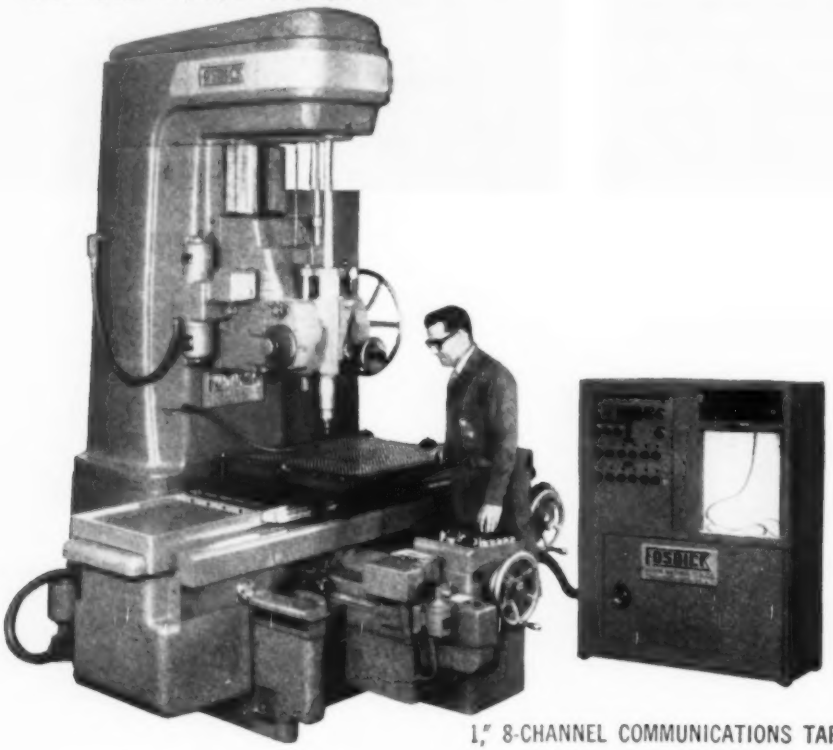
1" 8-CHANNEL COMMUNICATIONS TAPE

Inexpensive, widely used throughout industry, these tapes may be prepared simply on a Flexowriter or similar equipment, usually by the Production Engineering Dept. Provides a typewritten record automatically for easy checking against pre-planned program.



4" MYLAR PLASTIC TAPE

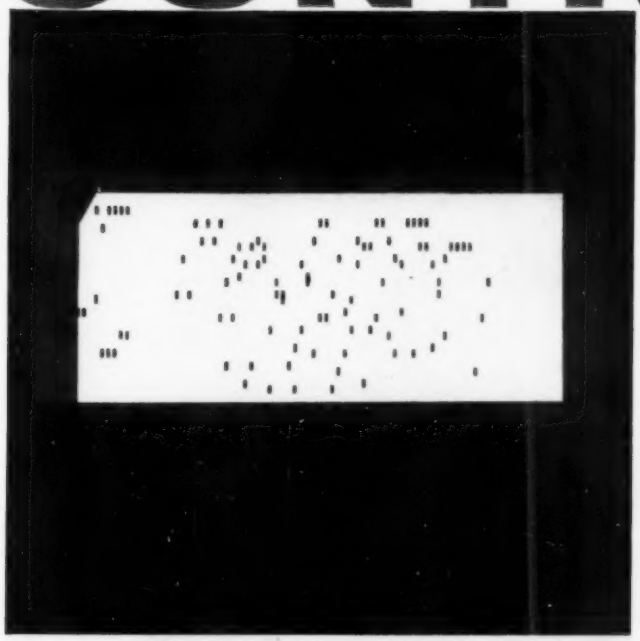
Least expensive of the generally accepted tape systems, particularly suitable for smaller shops machining parts with relatively few holes. Tape can be prepared easily by shop personnel.



1" 8-CHANNEL COMMUNICATIONS TAPE

4" MYLAR PLASTIC TAPE

CONTROL



for Fosmatic JIG BORERS and JIG GRINDERS

Any tape or card reader can be used to control a Fosmatic Jig Borer or Jig Grinder. And because the functions of the standard Fosmatic are actuated electrically, numerical control can be installed in the field—economically!

Speeds and feeds are changed by controlling electro-magnetic clutches through relay contacts. Table and saddle position is determined by a measuring system actuated by direct reading dials. For numerical control, these dials are driven by a fractional hp motor.

On a Fosmatic, you can program as many functions as you wish. Table X and Y positions (to .0001"), Feeds and Speeds, Spindle start and stop, Spindle feed start and stop, Spindle feed depth, Spindle head height, Automatic tool change. And only Fosmatic gives you a visual numerical check of coordinate location plus operation sequence number.

Example of savings made with Fosmatic numerical control. The illustration (left) shows one half of a mold with 900 cavities, each of which requires nine operations—a total of 8100! Time for the entire job was 100.25 hours, 25% of time consumed previously on a conventional jig borer.

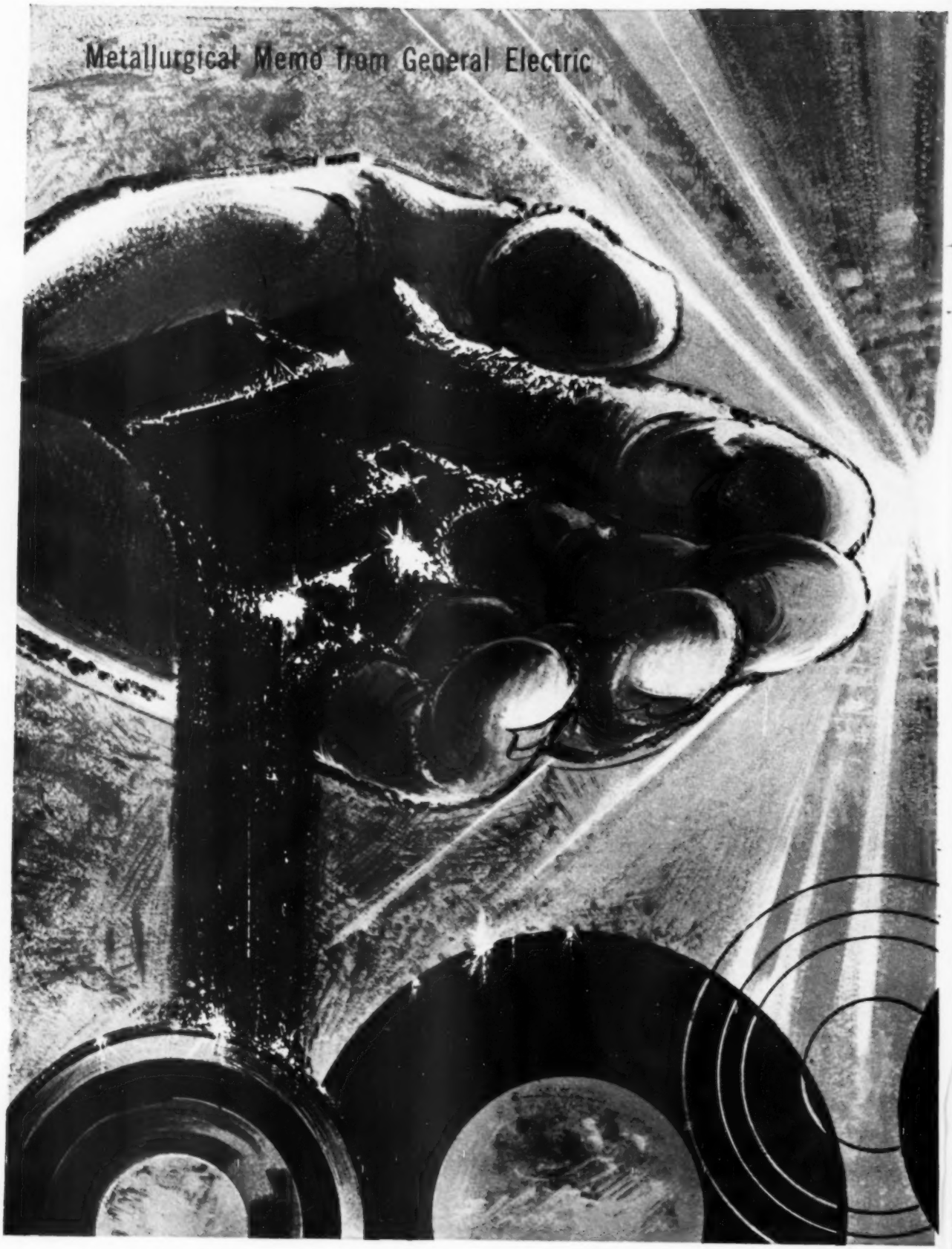
Write or call today for complete information on a numerically controlled jig borer or jig grinder to improve your production method.

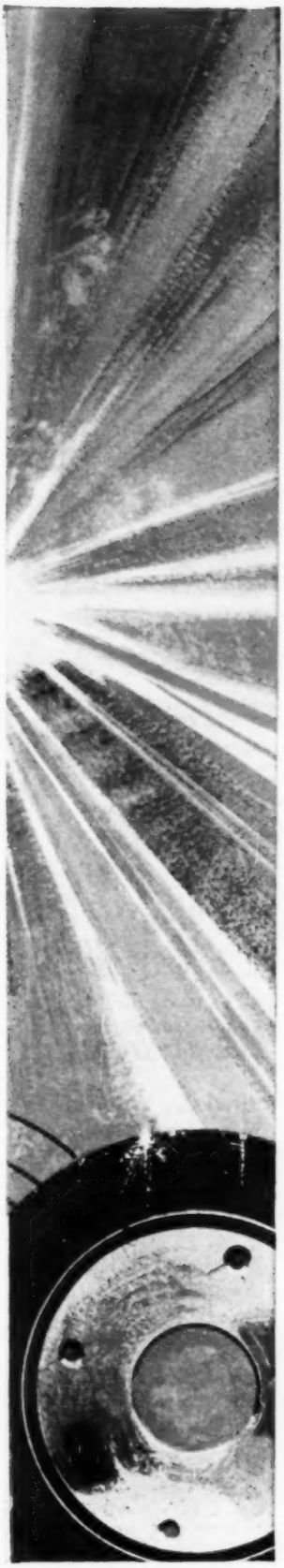
PUNCHED CARDS

This system can be integrated with card systems already in use by your company. Each job is programmed in a "deck" of cards; provides great flexibility, since an operation can be added or eliminated simply by making a new card or removing an old one.

PUNCHED CARDS

Buy a Fosmatic today—add Numerical Control tomorrow


Metallurgical Memo from General Electric



How G-E man-made industrial diamonds improve on nature's best

They out-perform natural bort an average of 35% in carbide grinding . . . industry no longer has to depend on nature's supply of diamonds

Man-made diamonds are a reality.

They were developed and are being manufactured *in quantity* by General Electric. Already used in grinding wheels, they out-perform natural diamonds on most carbide grinding applications by an average of 35%. They produce equal or better surface finishes. They have effected substantial production savings . . . and they have *ended* reliance on nature's supply of diamonds.

General Electric man-made diamonds are better because, while their chemical properties are the same as those of natural diamonds, their crystal structure is importantly different. G-E man-made diamonds are more blocky and rough surfaced. This provides extra support in the bond—makes G-E man-made diamonds stay in the wheel until more completely used up—minimizes the waste of lost diamonds. They are also more friable, so that sharp new cutting faces are constantly presented, resulting in a freer cutting wheel throughout the grinding operation.

Wheels made with General Electric man-made diamonds are available now. They'll deliver a production bonus averaging 35%. Be sure *you* cash in on this superior performance by specifying wheels containing G-E man-made diamonds from your regular wheel supplier. *Metallurgical Products Department of General Electric Company, 11149 E. 8 Mile Ave., Detroit 32, Michigan.*

METALLURGICAL PRODUCTS DEPARTMENT

GENERAL ELECTRIC

CARBOLOY® CEMENTED CARBIDES • MAN-MADE DIAMONDS
MAGNETIC MATERIALS • THERMISTORS • THYRITE® • VACUUM-MELTED ALLOYS

Republic ELECTRUNITE Mechanical Tubing is used in four locations across the top of the automatic apparatus that picks up and sets the bowling pins in place. The AMF Automatic Pinspotter is manufactured by the American Machine & Foundry Company, Brooklyn, New York.

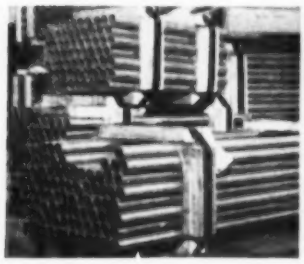
AMF . . . builds a better pinspotter for better bowling with Republic ELECTRUNITE Mechanical Tubing

On the initial order, Republic ELECTRUNITE® Mechanical Tubing saved American Machine & Foundry Company $34,000 in manufacturing their famous AMF Automatic Pinspotter.

AMF had been using tubing that required a boring operation on each end of the tube and centerless grinding on the O.D.

Because Republic's ELECTRUNITE Mechanical Tubing met AMF's O.D. tolerance requirements, the company was able to eliminate the boring and grinding operations. This resulted in a savings of $15,000 in fabricating operations. Another $19,000 was saved on the cost of ELECTRUNITE as compared with the tubing used previously.

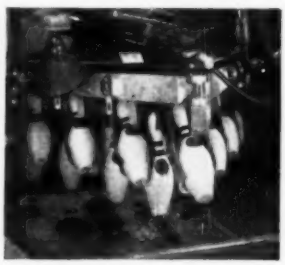
In uniformity and quality, in fabricating, in original costs, Republic's ELECTRUNITE Mechanical Tubing can save you time and money, too! Call your Republic representative, or write today.



Republic ELECTRUNITE Mechanical Tubing is delivered, cut to length, ready for fabricating. ELECTRUNITE Tubing is "electrically welded" resulting in built-in uniformity.

Slots to hold spotting cups in place are cut into ELECTRUNITE Tubing by machine. Concentricity of the ELECTRUNITE assures easy fabrication and smooth mechanical operation.

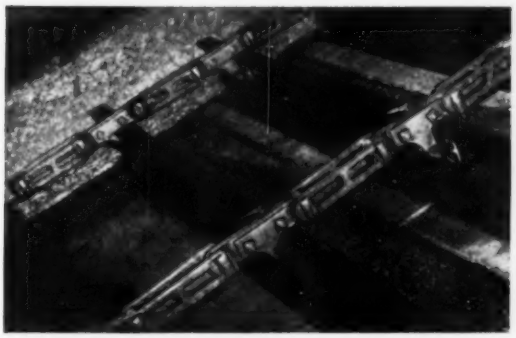
Drilling and cutting complete, the ELECTRUNITE Tubing is ready for assembly. Lightweight ELECTRUNITE offers uniform wall thickness, strength, ductility for greater serviceability.



Sensitivity in setting off-spot pins is the result of design and engineering, highest quality workmanship, and highest quality materials, such as Republic's ELECTRUNITE Tubing.

REPUBLIC NYLOK® FASTENERS SAFEGUARD PERFORMANCE SPECIFICATIONS. Republic fasteners are used extensively on Gemco Rotary, Reel, and Riding Power Lawn Mowers. Inset shows blade assembly securely locked to engine shaft with Nylok Cap Screw. An added advantage of Republic Nylok Bolts and Cap Screws is their ability to seal against fluid escape when wrenched tight. Nylon pellet in bolt body blocks flow of fluid along helical threaded path. Send for data.

REPUBLIC MANUFACTURERS' COARSE WIRE to meet every production need. Box Binding and Stapling, Brush Handle, Chain, Garment Hanger are only a few of the qualities regularly produced. Large tonnages are shipped to manufacturers of fan guards, wire partitions, concrete reinforcing specialties, plated shelves, racks and grilles, and numerous other products. Republic wire metallurgists are available to help you in solving production problems. Write today.



REPUBLIC HIGH STRENGTH STEEL IMPROVES SERVICE LIFE for many types of equipment. In the bottom of this conveyor, for example, it provides excellent resistance to abrasion and corrosion. Far less frequent replacement is required as compared with a bottom made of ordinary steel. And, its high strength-to-weight ratio allows use of lighter gages. Send for details.

REPUBLIC STEEL

World's Widest Range of Standard Steels and Steel Products

REPUBLIC STEEL CORPORATION
DEPT. AM-6300
1441 REPUBLIC BUILDING • CLEVELAND 1, OHIO

Please send information on the following Republic products:

☐ REPUBLIC ELECTRUNITE Mechanical Tubing
☐ Republic Manufacturers' Wire ☐ High Strength Steel
☐ NYLOK Bolts and Cap Screws

Name_____ Title_____

Company_____

Address_____

City_____ Zone____ State_____

THE ALL NEW CLEARING-AXELSON

The Lathe that Makes All Others Obsolete

A Startling New Concept in Lathe Design

25 inch swing over ways

16 inch swing over cross-slide

10 foot and up bed lengths

66 feeds

40 speeds

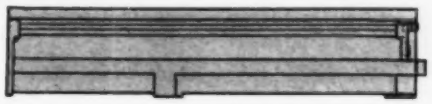
Up to 50 H.P. motor

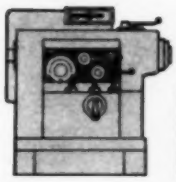
The new Clearing-Axelson is not just a face-lifting re-design. Rather, it is a completely new approach to lathe design and construction. Historically, lathes have been designed around cast beds with the headstock placed on top of the bed. In the new Clearing-Axelson the headstock is a complete unit, built to the floor. The bed is a complete unit built to the floor.

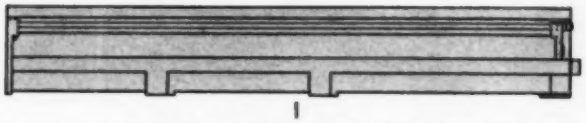
Construction is welded steel—far stronger than cast iron, and much more suitable for the addition of accessory tooling.

Performance? There has been nothing like it since lathes were first developed. The features shown here are just a part of the story. When you have seen this machine, you will know you have seen the future in engine lathe design . . . the Clearing-Axelson.

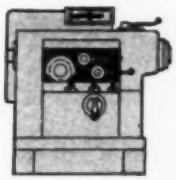
"MODULAR" BED CONSTRUCTION





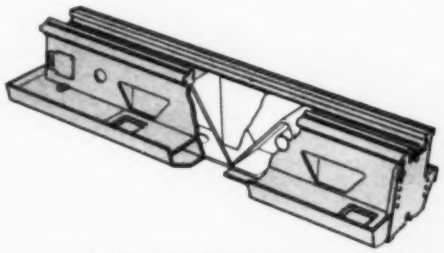


Beds are keyed and bolted to the headstock. The bearing surfaces are machined to guarantee rigid accurate alignment of bed, headstock and spindle, assuring precision and interchangeability. If at a later date you need a longer or different style bed, you needn't buy a new lathe—just order a new bed. ***Here is the building block concept—no problem of obsolescence!***



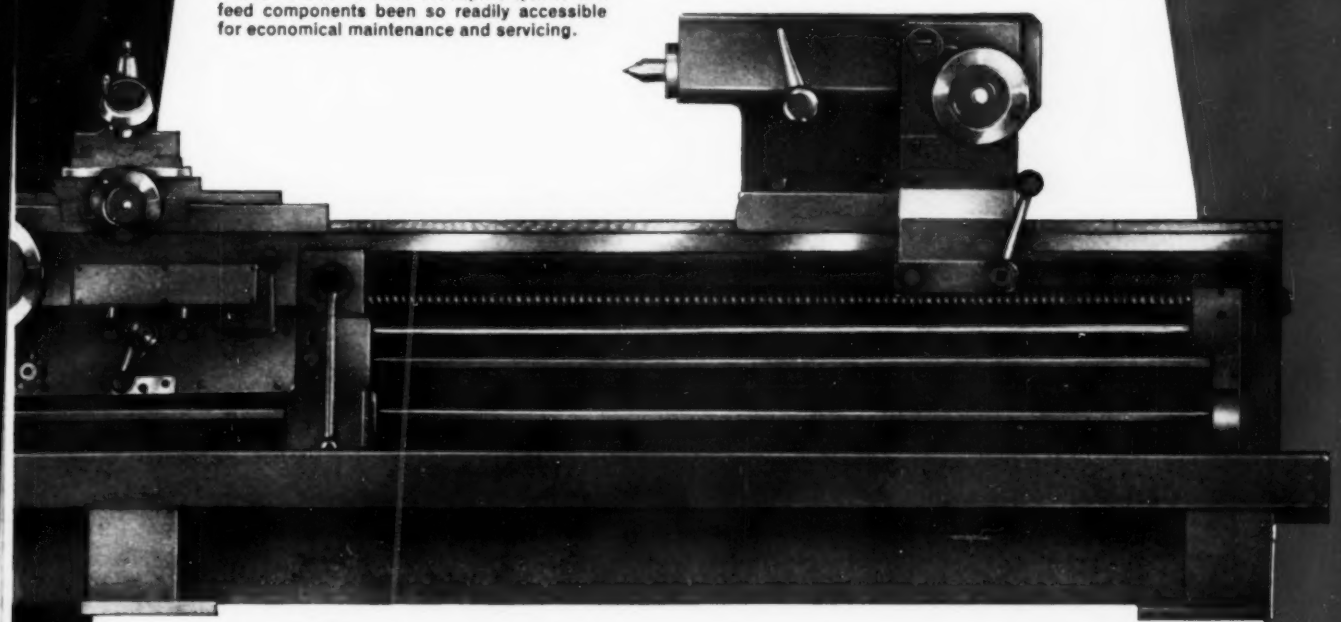
"MODULAR" HEADSTOCK CONSTRUCTION

The headstock is a modular assembly in which both the main drive and the feed box may be easily removed as units by a simple disassembly. Never before has it been easier for the user to change the entire speed or feed range of a lathe. Never before have spindle, drive and feed components been so readily accessible for economical maintenance and servicing.



ALL STEEL WELDED BED—18 TIMES STRONGER THAN CAST IRON

Stronger homogeneous steel plate provides strength where it is needed—with none of the limitations of cast iron design. Pyramid shaped reinforcing ribs are used the entire length of the bed for high torsional rigidity.



Clearing, division of U. S. Industries, Inc. also manufactures power presses of all types, dies and special tooling, and special equipment for the aircraft and missiles industry.

USI Clearing

DIVISION OF U.S. INDUSTRIES, INC.

6499 W. 65th Street • Chicago 38, Illinois

Modern celestial navigation systems for sophisticated jet bombers use the Simulacrum astro-tracker test table pictured above. The Alignment Fixture for this intricate instrument establishes a point to simulate a star . . . and the alignment calibration must be accurate to one second of arc, for an error as small as one second could result in serious inaccuracies. Consequently, the machining of the Alignment Fixture must be accomplished with extreme precision, as pictured in the finish milling of the critical bearing surfaces at the B. G. Instrument Corporation of Corona, New York.

B G INSTRUMENT CORP

When the job consists of a variety of operations on so critical a part as the Alignment Fixture for the Simulacrum, it is all but mandatory to machine it on the SIP HYDROPTIC. For work of this character, the ultimate in precision is maintained . . . axial centers must be absolutely "dead accurate" (within a tenth) . . . and all bores and locating surfaces must be within an accumulated error not exceeding 0.0005".

Here you see the machining of this Fixture in progress—on the SIP HYDROPTIC 6A Jig Boring and Milling Machine . . . in the temperature-controlled jig boring room of the B. G. Instrument Corporation of Corona, New York.

In the new series of HYDROPTICS . . . featuring greater ease of operation, increased range and capacity, and a guaranteed visual accuracy of 0.0001" . . . the basic Precision that is SIP assures confidence whenever critically accurate machining is demanded. Catalog No. 1149 tells the complete story of the SIP HYDROPTIC 6A; send for it.

SIP

Production with precision

AMERICAN SIP CORPORATION

HIGH PRECISION MACHINE TOOLS & MEASURING EQUIPMENT

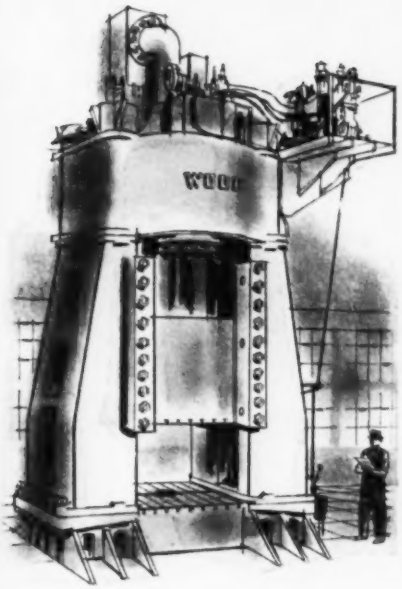
100 EAST 42nd STREET, NEW YORK 17, N. Y.

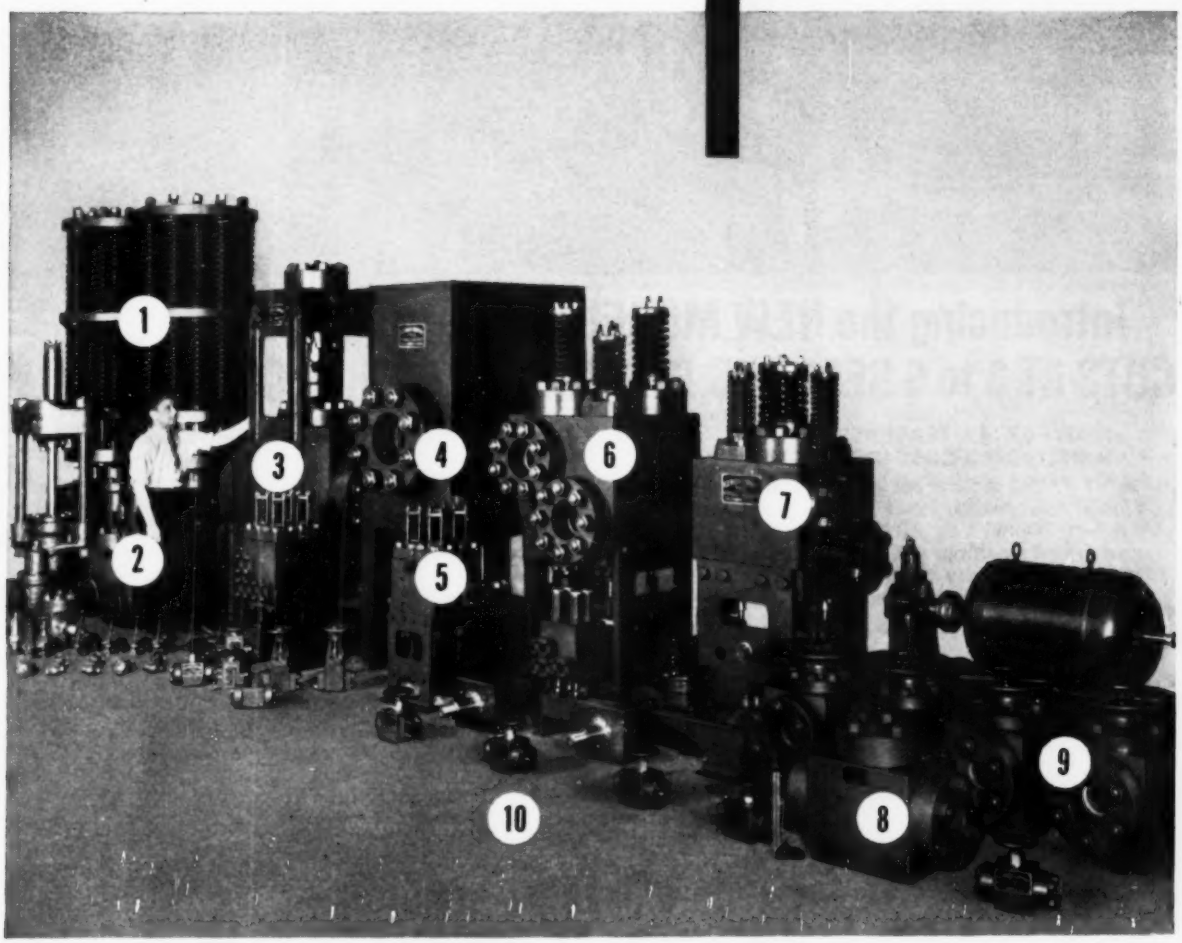
Every valve you need for a complete hydraulic system . . . from WOOD

Need a special valve or a complete hydraulic system? Call on R. D. Wood Company for help from men who know their high pressure valves. Take the line-up below, all Wood valves from one hydraulic forging press installation, working pressure 4500 psi. Note the broad range of sizes and types, from the small Stop and Check Valves to the large 6" x 8" Shock Alleviator Valves. They have been developed from years of experience in designing and building hydraulic equipment. Whatever your requirements, our engineering staff can design and apply the correct valves to do the job. Write today for complete information contained in the Wood brochure, "High Pressure Hydraulic Valves."

R. D. WOOD COMPANY

PUBLIC LEDGER BUILDING • PHILADELPHIA 5, PENNSYLVANIA





1. 6"x 8" Shock Alleviators **2.** 2½"x 4½" Twin Tilting Valve **3.** 9" Accumulator Shut off Valve **4.** 9" Accumulator Safety Shut off Valve **5.** 1½" Mandrel Gear Control Valve **6.** 6" Control Valve **7.** 4½" Control Valve **8.** 4" Check Valve **9.** 4" Stop Valves **10.** Misc. Stop, Check and Control Valves

◄ CIRCLE 204 READER SERVICE CARD

CIRCLE 205 READER SERVICE CARD

Introducing the NEW MODEL 1-A SEVER-ALL Machine... CUTS AT 3 to 6 SECONDS PER SQUARE INCH—ECONOMICALLY

MANY EXTRA FEATURES AT A DELIVERED COST UNDER $500

You get the cut quality and capacity of machines nearly three times as expensive when you use the new Model 1-A SEVER-ALL oscillating dry abrasive cut-off machine. Available from your distributor's stock. Here's why the #1-A SEVER-ALL is ideal for industrial and machine shop operations:

BIG CAPACITY • Up to 2" square solids, 3½" O. D. pipe and tubing, 3" angle iron, and 4" channels . . . of cold rolled, stainless, and alloyed steel; cast iron; and nonferrous metals. Wheel oscillation, an exclusive feature in this price range, provides this *above-average* capacity.

SPEED • Cuts a 2" x 2" hardened steel bar in 16 seconds . . . other shapes and sizes at 3 to 6 seconds per square inch.

QUALITY • Clean, smooth cuts, even on large sections, because wheel oscillation provides cooler cutting.

ECONOMY • In addition to low initial cost, the Model 1-A SEVER-ALL is inexpensive to operate . . . occupies minimum floor space . . . requires little or no set-up time . . . eliminates annealing costs . . . gives more cuts per wheel because of oscillation.

SIMPLICITY • Just two SEVER-ALL cutting wheel specifications will do *all* your SEVER-ALL cutting jobs. A positive, screw-type vise holds all regular shapes, and an adjustable work stop provides speed and accuracy.

ANGLE CUTS • Optional accessory permits cutting angles up to 45° in either direction.

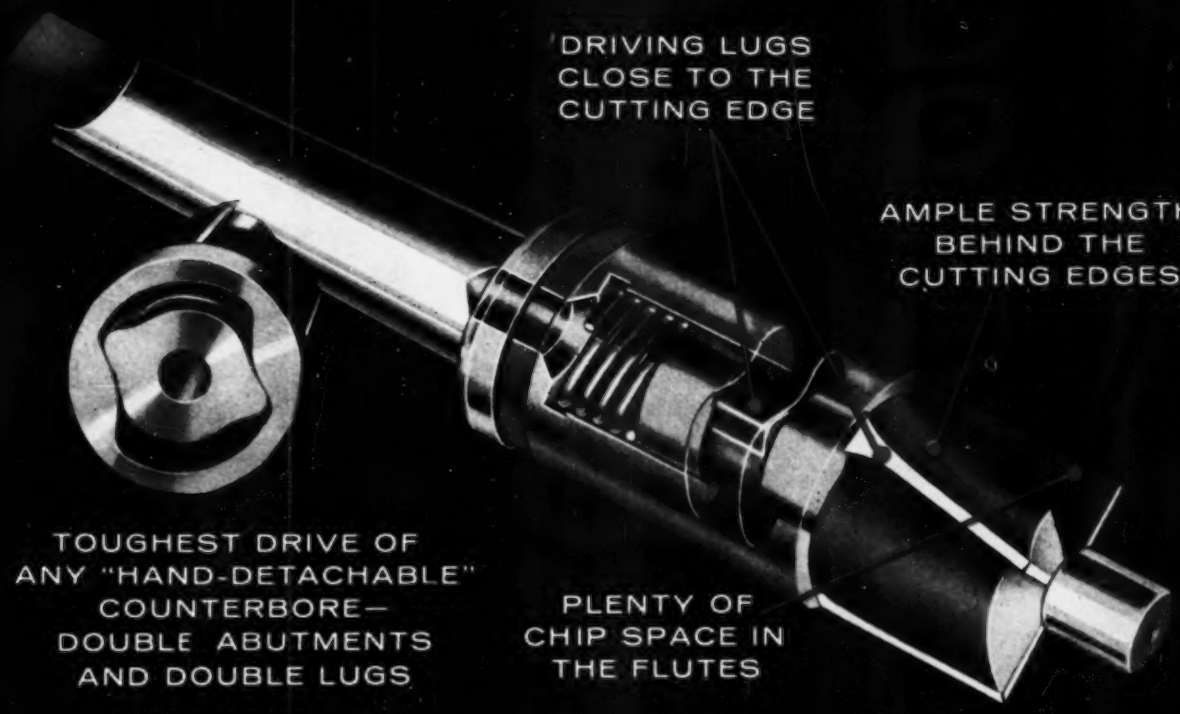
NEW SEVER-ALL AVAILABLE FROM DISTRIBUTORS

Very likely your own distributor already stocks the Model 1-A SEVER-ALL machine and wheels. If not, let us know, and we'll give you the name of your nearest SEVER-ALL distributor. Also, we'll be glad to send you complete details on this new machine. Just ask for **Bulletin DH-106.**

ALLISON-CAMPBELL DIVISION
AMERICAN CHAIN & CABLE

ACCO

923-5 Connecticut Avenue, Bridgeport 2, Conn.


DRIVING LUGS CLOSE TO THE CUTTING EDGE
AMPLE STRENGTH BEHIND THE CUTTING EDGES
TOUGHEST DRIVE OF ANY "HAND-DETACHABLE" COUNTERBORE— DOUBLE ABUTMENTS AND DOUBLE LUGS
PLENTY OF CHIP SPACE IN THE FLUTES

Here's why Continental Counterbores last longer

A quarter-turn by hand engages or releases a Continental Counterbore. This Standard Drive is also used for Continental spotfacers, countersinks, inverted cutters and special end-cutting tools.

58-48

Quality material and care in manufacture are two good reasons why Continental Counterbores last longer. Another reason is design.

Because of the way double driving lugs on the cutter shank engage abutments in the holder socket, driving forces simply create *compression*, not shearing or wedging action. The result is a balanced, positive drive—the toughest drive of any "hand-detachable" counterbore.

Notice how close the drive lugs are to the seating shoulder of the cutter. They're designed that way to give the extra torsional rigidity needed to resist machining forces. Flute design provides ample area for smooth chip flow, easy cutting.

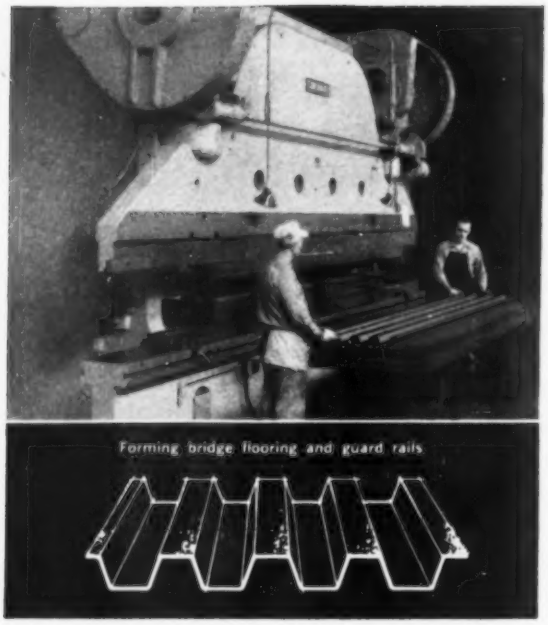
And, of course, no matter how heavy the cut, a Continental Counterbore will always disengage with just a *twist of the wrist.*

Write direct, or ask your Ex-Cell-O Representative for a free copy of a new booklet that lists standard Counterbore sizes and tells everything you'll want to know about these versatile tools.

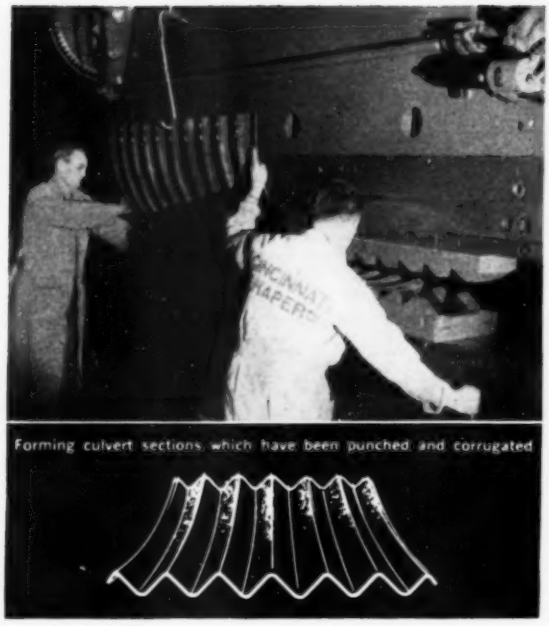
Continental CTW TOOL WORKS

DIVISION OF EX-CELL-O CORPORATION, DETROIT 32, MICHIGAN

CIRCLE 207 READER SERVICE CARD

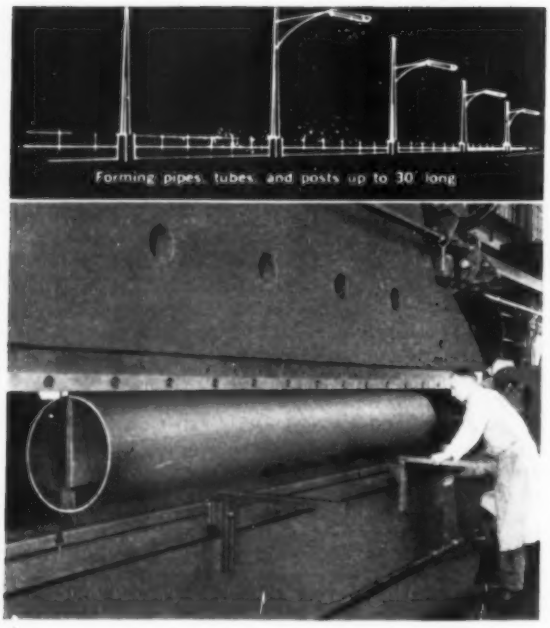


Forming bridge flooring and guard rails

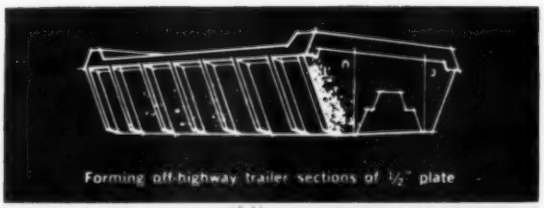


Forming culvert sections which have been punched and corrugated

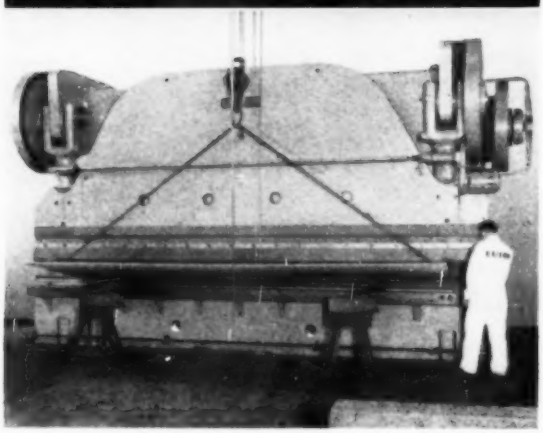
Tool up with Cincinnati® for

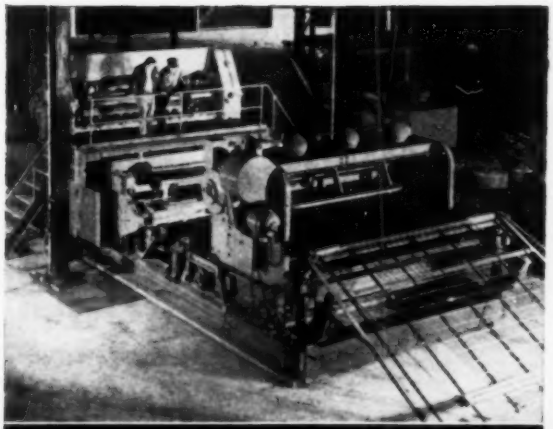


Forming pipes, tubes, and posts up to 30' long

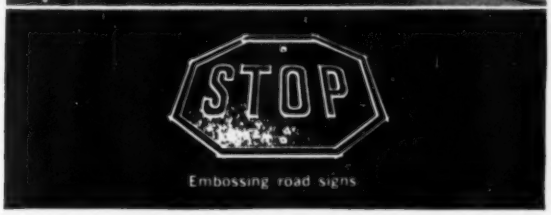


Forming off-highway trailer sections of ½" plate



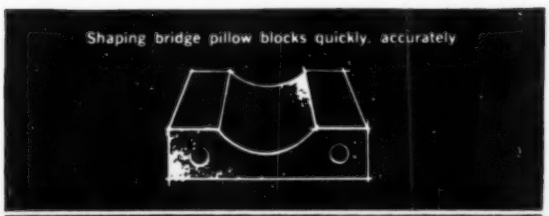


Automatically shearing welded steel road mesh

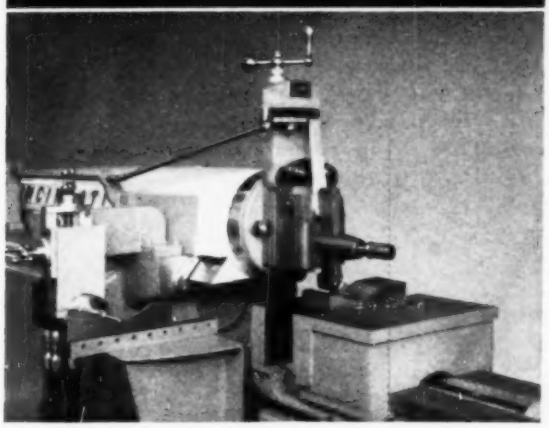


Embossing road signs

America's huge road program



Shaping bridge pillow blocks quickly, accurately



Here are just a few of the many jobs now being done profitably on Cincinnati® Shears, Press Brakes, and Shapers—helping to build America's highways.

Your share of the profits from this vast highway program will depend on your ability to supply metal components on time, in sufficient volume, to specifications, and at competitive prices. Whether you make guard rails or bridges, lampposts or culverts, curb forms or earthmovers—now is the time to measure your shear, press brake, and shaper capacity against the demand coming down the road.

Don't wait for competitive traffic. Write Department A for more data on these Cincinnati applications: Catalog B-5 on Press Brakes; Catalog S-7R on Shears; Catalog N-7 on Shapers.

Shapers / Shears / Press Brakes

THE CINCINNATI SHAPER CO.

Cincinnati 11, Ohio, U.S.A.

A

new concept

to simplify your spring

design and purchasing problems

Select-A-Spring

ready-to-use engineered standard springs

Now you can select compression or extension springs from hundreds of ready-to-use, engineered standard-specification sizes. No fuss or paper work—no blueprints or drawings necessary. Select-A-Spring enables buyer or designer to pinpoint his needs without delay. Simply match your requirements to the Select-A-Spring list, order by catalog number, quantity and material. Especially convenient where quantities are moderate.

Select-A-Springs are pre-engineered, using wire certified to military and aircraft specifications, in various lengths, diameters, rates, and loads up to 20 lb. They meet industry and military standards. Material is either music wire or stainless steel. Compression springs are squared and ground. Extension springs have regular loops. Other ends and loops optional.

Whether your need is immediate or future, write now for the A.S.C. Select-A-Spring list. Keep it handy as a time-saving, useful spring service.

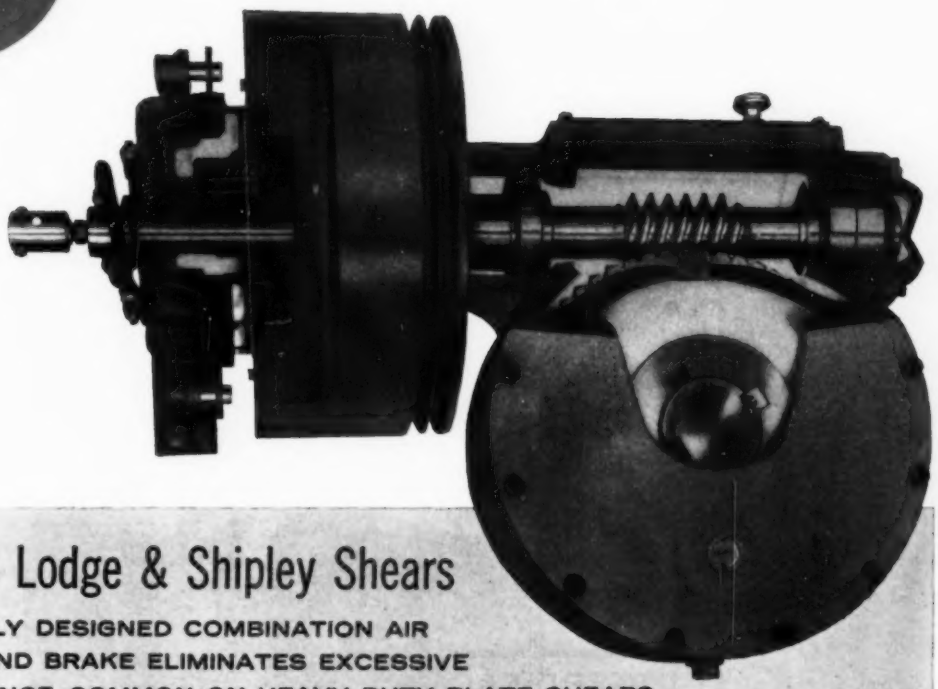
Associated Spring Corporation

General Offices: Bristol, Connecticut

Wallace Barnes Division, Bristol, Conn. and Syracuse, N. Y.
B-G-R Division, Plymouth and Ann Arbor, Mich.
Gibson Division, Chicago 14, Ill.
Milwaukee Division, Milwaukee, Wis.
Raymond Manufacturing Division, Corry, Penna.
Ohio Division, Dayton, Ohio
F. N. Manross and Sons Division, Bristol, Conn.
San Francisco Sales Office, Saratoga, Calif.
Seaboard Pacific Division, Gardena, Calif.
Cleveland Sales Office, Cleveland, Ohio
Dunbar Brothers Division, Bristol, Conn.
Wallace Barnes Steel Division, Bristol, Conn.

Canadian Subsidiary: Wallace Barnes Co., Ltd., Hamilton, Ont. and Montreal, Que. Puerto Rican Subsidiary: Associated Spring of Puerto Rico, Inc., Carolina, P.R.

EXTRAS on the machine . . . not on the invoice!



Only on Lodge & Shipley Shears

...SPECIALLY DESIGNED COMBINATION AIR CLUTCH AND BRAKE ELIMINATES EXCESSIVE MAINTENANCE COMMON ON HEAVY DUTY PLATE SHEARS

The "standard extras" you find on Lodge & Shipley Shears, although not reflected in the price, are important in time-saving, effortless operation, accuracy and low-cost service.

THE COMBINATION AIR CLUTCH AND BRAKE, for example . . . its single unit design positively eliminates overlap between clutch and brake. Disc-type construction is self-adjusting for fast, smooth starting and safe, positive stopping. The clutch provides automatic overload safety; the brake applies automatically in the event of electrical or air supply failure.

NO OTHER SHEAR, EVEN AT EXTRA COST, can offer the exclusive combination of features found, for instance, on the ½" Lodge & Shipley Shear:

- 2-stage Hydraulic Holddown System
- Remote-operating Foot Control • Ball Transfer Table
- Motorized Front-Operated Back Gauge
- One-piece Shaft with Integral Eccentrics
- Blade Clearance Indicators • Air Counterbalances
- Air-cushioned Back Gauge • Blade Changing Jigs
- Fast, One-man Upper Blade Adjustment
- Independent Holddown Fingers • Quad-life Worm Gear

Capacities to ½" x 12'

Find out how much more you get . . . **WITHOUT EXTRA COST** . . . on a Lodge & Shipley Shear. For details, see Sweet's Machine Tool File or request Bulletin No. PS-15 from: **The Lodge & Shipley Co., 3056 Colerain Ave., Cincinnati 25, Ohio.**

Lodge & Shipley Your LODGE-ical Choice!

◄ CIRCLE 210 READER SERVICE CARD

CIRCLE 211 READER SERVICE CARD

A PRODUCT OF SKILL

BUTTERFIELD
100%
INSPECTED
TOOLS

the complete line

Butterfield drills, reamers, taps, dies, counterbores, cutters, end mills, hobs and carbide tools are craftsmanship-produced and are delivered rapidly anywhere. Warehouses in Chicago, Cleveland, Detroit, Fort Worth, Los Angeles, New York and San Francisco. **Call your Butterfield Distributor.**

BUTTERFIELD

BUTTERFIELD DIVISION, UNION TWIST DRILL COMPANY, DERBY LINE, VERMONT

46 CIRCLE 212 READER SERVICE CARD

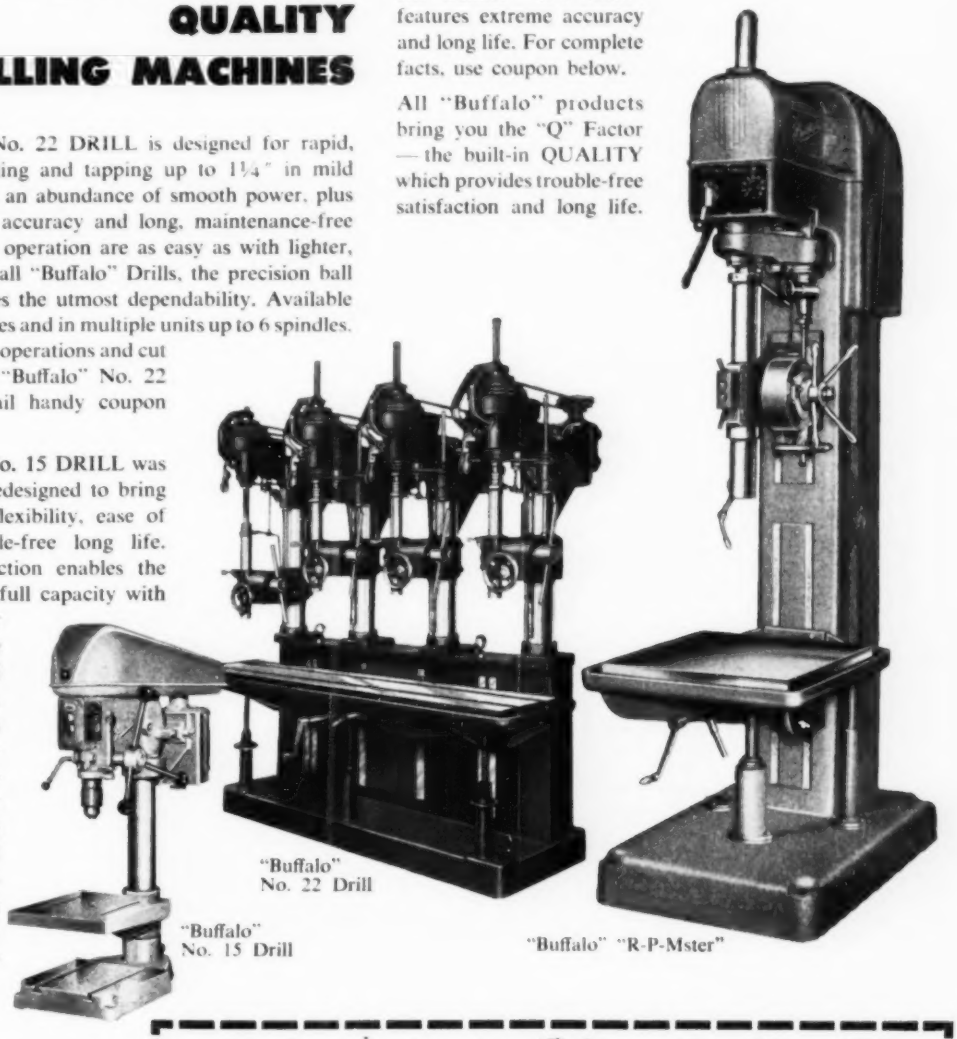
FOR LONGER LIFE— BETTER PERFORMANCE GET "BUFFALO" QUALITY DRILLING MACHINES

THE "BUFFALO" No. 22 DRILL is designed for rapid, precise sequence drilling and tapping up to 1¼" in mild steel. The No. 22 has an abundance of smooth power, plus complete rigidity for accuracy and long, maintenance-free life. Adjustments and operation are as easy as with lighter, sensitive drills. As in all "Buffalo" Drills, the precision ball bearing spindle assures the utmost dependability. Available in floor or pedestal types and in multiple units up to 6 spindles. To speed your drilling operations and cut costs, investigate the "Buffalo" No. 22 Drill. Check and mail handy coupon below.

THE "BUFFALO" No. 15 DRILL was recently completely redesigned to bring you a new high in flexibility, ease of operation and trouble-free long life. Rigid, heavy construction enables the No. 15 to operate at full capacity with no undue strain or wear. Yet extreme sensitivity is provided for small hole drilling. Fill your needs from floor, bench and pedestal types—the two latter in 1 to 6 spindle models. See how the "Buffalo" No. 15 Drill can economically increase your production output. Mail coupon below for full information.

THE "BUFFALO" "R-P-Mster" is the famous variable speed drill which has attained new heights of drilling ease and smoothness. Newly re-designed for greater capacities, the No. 1A is rated at 1" in mild steel, the No. 2A is rated at 1½" in mild steel and the No. 3A at 2". Easily-reached controls vary the spindle speed infinitely within a wide range. Available in pedestal models (1 to 6 spindles), the "Buffalo" "R-P-Mster" features extreme accuracy and long life. For complete facts, use coupon below.

All "Buffalo" products bring you the "Q" Factor — the built-in QUALITY which provides trouble-free satisfaction and long life.



"Buffalo" No. 22 Drill

"Buffalo" No. 15 Drill

"Buffalo" "R-P-Mster"

"Buffalo"

DRILLING
PUNCHING
SHEARING
BENDING

BUFFALO FORGE COMPANY

509 **Broadway, Buffalo, N. Y.**

Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

Please send me additional information on the following "Buffalo" Drilling Machines:

☐ No. 22 ☐ "R-P-Mster" ☐ No. 15

NAME _____

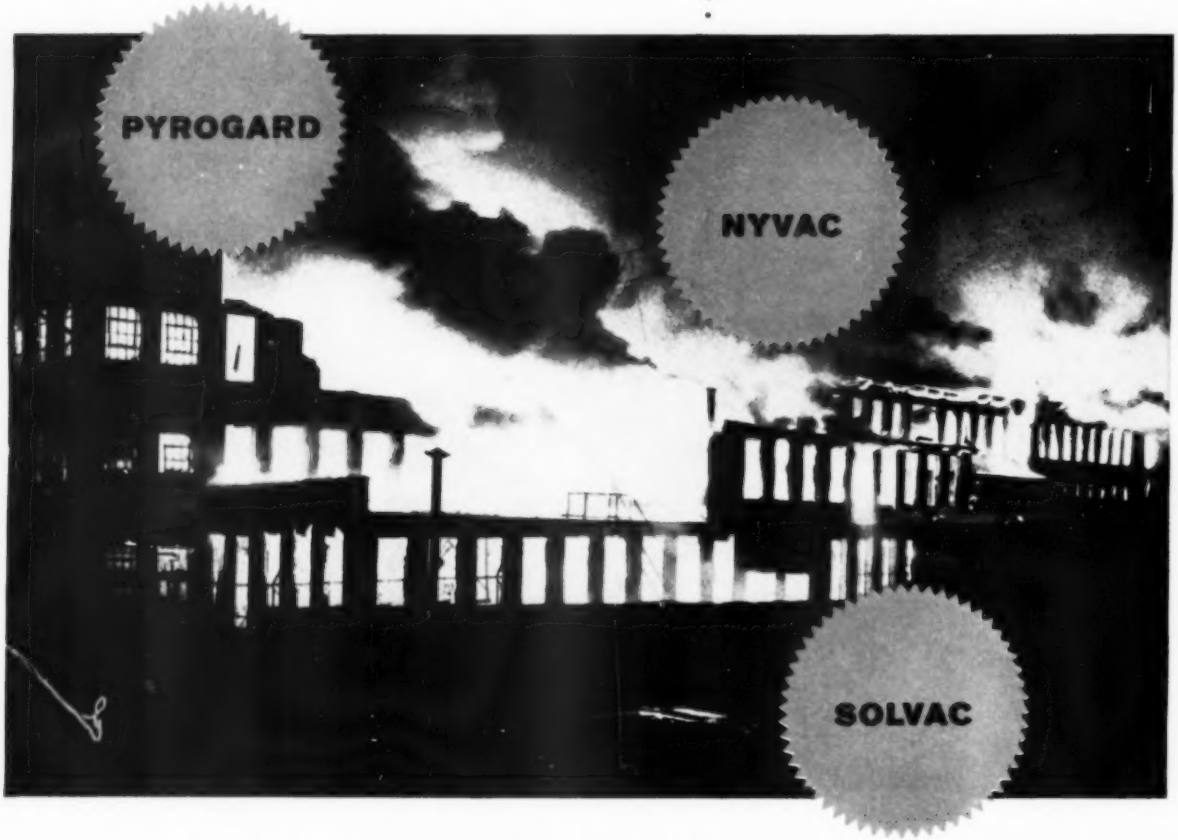
FIRM _____ TITLE _____

ADDRESS _____

CITY _____ ZONE ____ STATE _____

New Low-Cost Fire Protection

Protect your personnel, property, production— with a Mobil Fire-Resistant fluid that exactly meets your needs!



If any of your hydraulic systems operate near a source of ignition you're in need of a fire-resistant fluid. There are three types to choose from: Straight Synthetic, Water Base Synthetics and Emulsions of Water and Oil. With the introduction of Pyrogard, Nyvac and Solvac . . . now Mobil can supply you with *all three types.*

Each type Mobil fluid is designed for a definite field of service. Used within its field, each Mobil fluid will maintain production levels, protect your hydraulic systems against wear and deposits, assure precise machine operation.

A Mobil engineer will analyze your plant's needs and recommend the most economical type of fire-resistant fluid. He will also help you eliminate expensive system leakage . . . help prepare system for this type of fluid . . . even help train your maintenance crew.

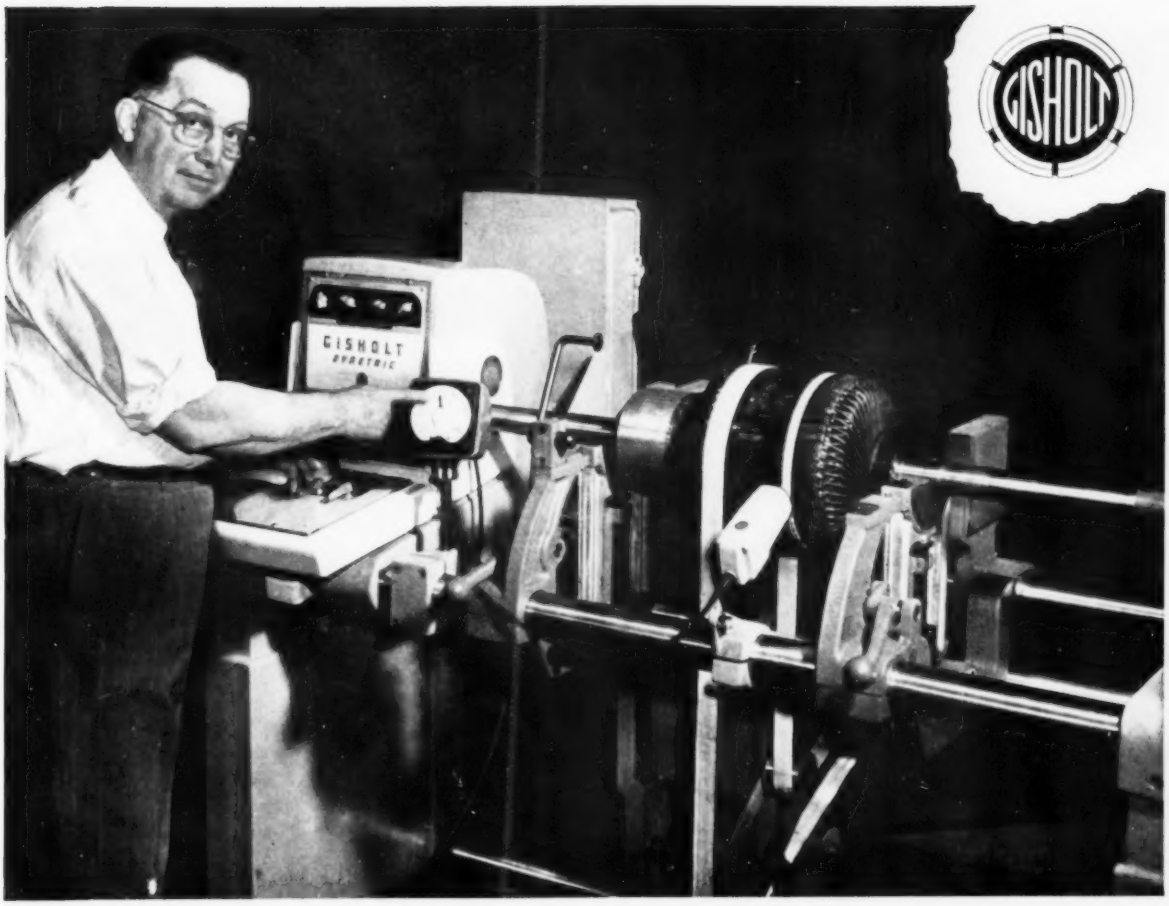
Call your Mobil representative for full details on Mobil fire-resistant fluids. It's the lowest-cost fire insurance you can buy!

For detailed brochure on Mobil Fire-Resistant Hydraulic Fluids, write on company letterhead to Socony Mobil Oil Company, Inc., Room 2060D, 150 E. 42nd Street, New York 17, N.Y.

Mobil **CORRECT LUBRICATION**

Another reason you're Miles Ahead with Mobil

SOCONY MOBIL OIL COMPANY, INC., and Affiliates: MAGNOLIA PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION, MOBIL OVERSEAS OIL COMPANY, INC.



When a GISHOLT BALANCER tells you the story —you don't have to translate it!

Note that dial reading! It does more than you may suspect.

Unlike other balancing machines, it does not merely indicate amount of unbalance in arbitrary units and leave it to the operator to interpret in terms of correction. Gisholt Balancers can tell the story *directly* in terms of correction units. No translation needed. No computation. No charts or graphs.

Because of their infinitely variable sensitivity, Gisholt Balancers are easily adjusted for the job at hand. Correction units such as $\frac{1}{8}$" lengths of wire solder, $\frac{1}{64}$" depths for a certain size of drill, washers of a specific weight, etc., can be used. Readings, in terms of these units, are shown directly on the amount meter.

Think what that means in time saving alone! Yet this is only one of many ways Gisholt enables you to set—and maintain—higher standards for your balancing work.

If your product includes the use of rotating parts, by all means check Gisholt for the most recent information on balancing.

GISHOLT MACHINE COMPANY

Madison 10, Wisconsin

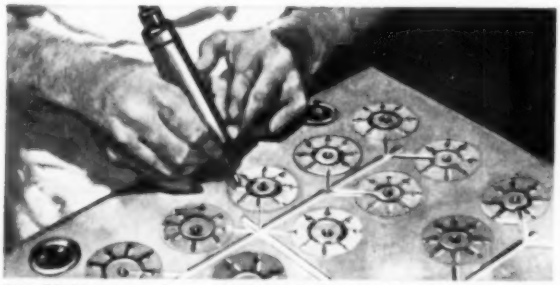
DYNETRIC BALANCERS GISHOLT

ASK YOUR GISHOLT REPRESENTATIVE ABOUT GISHOLT FACTORY REBUILT MACHINES WITH NEW MACHINE GUARANTEE

Toolmaker's Skill is the marvelous science of making things fit.

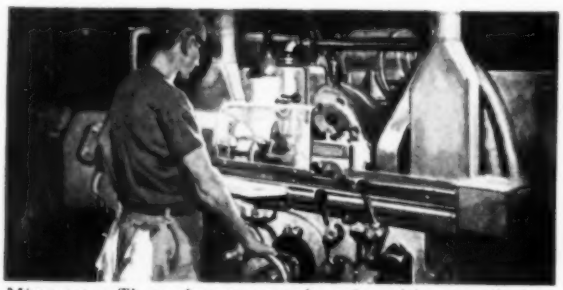
Making tools for toolmakers

Gage Blocks, so important to toolmaker's precision measurements, obtain their own close accuracy through the use of Norton lapping machines. Norton lappers are among industry's most valuable "fit and finish" tools.



Die Making gets increasingly delicate as the work nears the finish. Here the toolmaker adds his final touch, using a Norton tiny grinding wheel — preferred because his work must be perfect.

Touching Up a high speed milling cutter is often done with an India brand oilstone file. Final honing is frequently done with an Arkansas oilstone file. Norton and its divisions are the important sources for both.



Micrometers Themselves are a product of precision manufacture and precision-prepared abrasives. Here a man is grinding a micrometer thread die with a Norton V-face grinding wheel. There are more than 200,000 types of Norton grinding wheels.

Making better products...

puts a man on his mettle

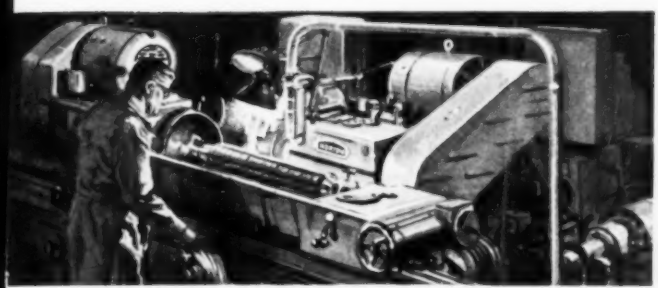
Inventing a tool to make other tools better was the work of an unknown prehistoric genius. A nice start!

Thousands of years later — here at Norton Company — a constant improvement of tools for more efficient production is still going on. Bigger, better and more important as science opens new vistas. Based on this invention, toolmaking has become a great industry serving all industry.

Norton abrasives are chief among "toolmakers' tools" — respected and preferred wherever toolmakers are at work. It is this craft of the toolmaker that turns the designer's ideas into practical production implements.

On this page are a few of the many modern ways in which Norton helps the man who uses the micrometers. Further along — on the production line — Norton abrasives keep the work coming out as it should. This is how Norton serves — making better products . . . to make your products better.

NORTON
ABRASIVES



Precision Finishing to extremely close tolerances is possible on this large Norton grinding machine. Precision engineering gave it a "feather touch". Here a machine spindle is being finished to an accuracy of plus or minus 1/10 of a thousandth of an inch.

Around the world and still expanding

Grinding Wheels Plants — Worcester, Mass.; Santa Clara, Calif.; Hamilton, Ontario; South Africa; England; France; Germany; Italy; Brazil.

Behr-Manning Plants — Coated Abrasives and Pressure-Sensitive Tapes — Troy, N. Y.; Canada; Australia; France; Northern Ireland; Argentina; Brazil.

Abrasive Plants — Huntsville, Alabama; Chippawa, Ontario; Cap-de-la-Madeleine, Quebec; Brazil.

Grinding and Lapping Machine Plant — Worcester, Mass.

Refractories Plant — Worcester, Mass.

Electro-Chemical Plants — Chippawa, Ontario; Huntsville, Alabama; Cap-de-la-Madeleine, Quebec.

Norton Pike Plant — Sharpening Stones — Littleton, New Hampshire.

Bauxite Mines — Bauxite, Arkansas.

General offices: Norton Company, Worcester, Mass.

to make your products better

ARMSTRONG

TOOL HOLDERS

A Correct Tool for Every Lathe Operation

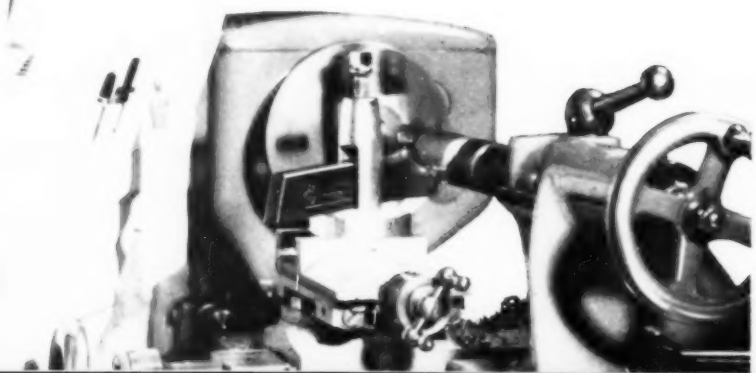
You can save time (and money) by ensuring that your machine tools are equipped with *adequate numbers* of the correct ARMSTRONG Tool Holders. The ARMSTRONG System of Tool Holders includes correctly designed tools for *every* standard operation on lathes, shapers, and planers, and for many operations on turret lathes and screw machines. By utilizing the ARMSTRONG System of Tool Holders, you can reduce tooling costs, eliminate down time in tooling up, operate your machine tools at maximum feeds and speeds.

ARMSTRONG Tool Holders are long-lasting tools. They are strong beyond need, handy and efficient, profitable to use, and are readily available from your local ARMSTRONG Distributor.

Check over your ARMSTRONG Tool Holder needs.
Write for literature.

INDUSTRIAL DISTRIBUTORS · THE RIGHT HAND OF PRODUCTION ·

If you do not know the name of your local ARMSTRONG Distributor, inquire when asking for literature.



ARMSTRONG BROS. TOOL CO. 5215 W. ARMSTRONG AVE. CHICAGO 46, ILL.

about a Hush-Hush operation

What's being produced here is restricted; but *where* and *how* it's made is a story in itself. This photo shows a section of the Experimental Machine Shop of the Systems Development Laboratories, Hughes Aircraft Company, Culver City. You know that output from a shop like this doesn't come from clunkers; obviously these machine tools are carefully chosen for the utmost in speed, versatility, and precision. If you can count 16 lathes (we can!) you'll be counting *16 Monarch 10" Model EE Sensitive Precision Toolmaker's Lathes!* And this is only a small percentage of the Monarch lathes used in the Hughes plant.

Just take a look at the partial list of Model EE features and you'll see why it's unnecessary for us to generalize about the machine — though we'd like to emphasize again the value to users of the all-electric drive direct to spindle and the great range of speeds. And that the Air-Gage Tracer can be applied.

Here's a lathe in a class by itself. Our Booklet 305-1 tells all — and it's no secret! Write or call —

SOME MODEL EE FEATURES

- A true high speed lathe for small work — speed ranges up to 40 to 4000 R.P.M. 5 H.P. machine tool duty drive.
- All electric drive direct to spindle through multiple "V" belts. No gears in headstock — an absolute must for small high precision work.
- 60 thread changes and 50 feed changes! This, plus wide speed range, enables machine to handle at top efficiency any job within its swing capacity.
- For thread chasing up to 100% faster, has exclusive combination of electric leadscrew reverse and variable reverse speed control. Available also without leadscrew and other thread chasing parts.
- Easy, fatigue-free operation. Base design lets operator work close in comfort.
- Flame hardened and ground ways for both carriage and tailstock. Bed all in one piece — no inserts.
- Thousands of these machines in use attest to their wide acceptance for the turning of small precise work of all kinds.

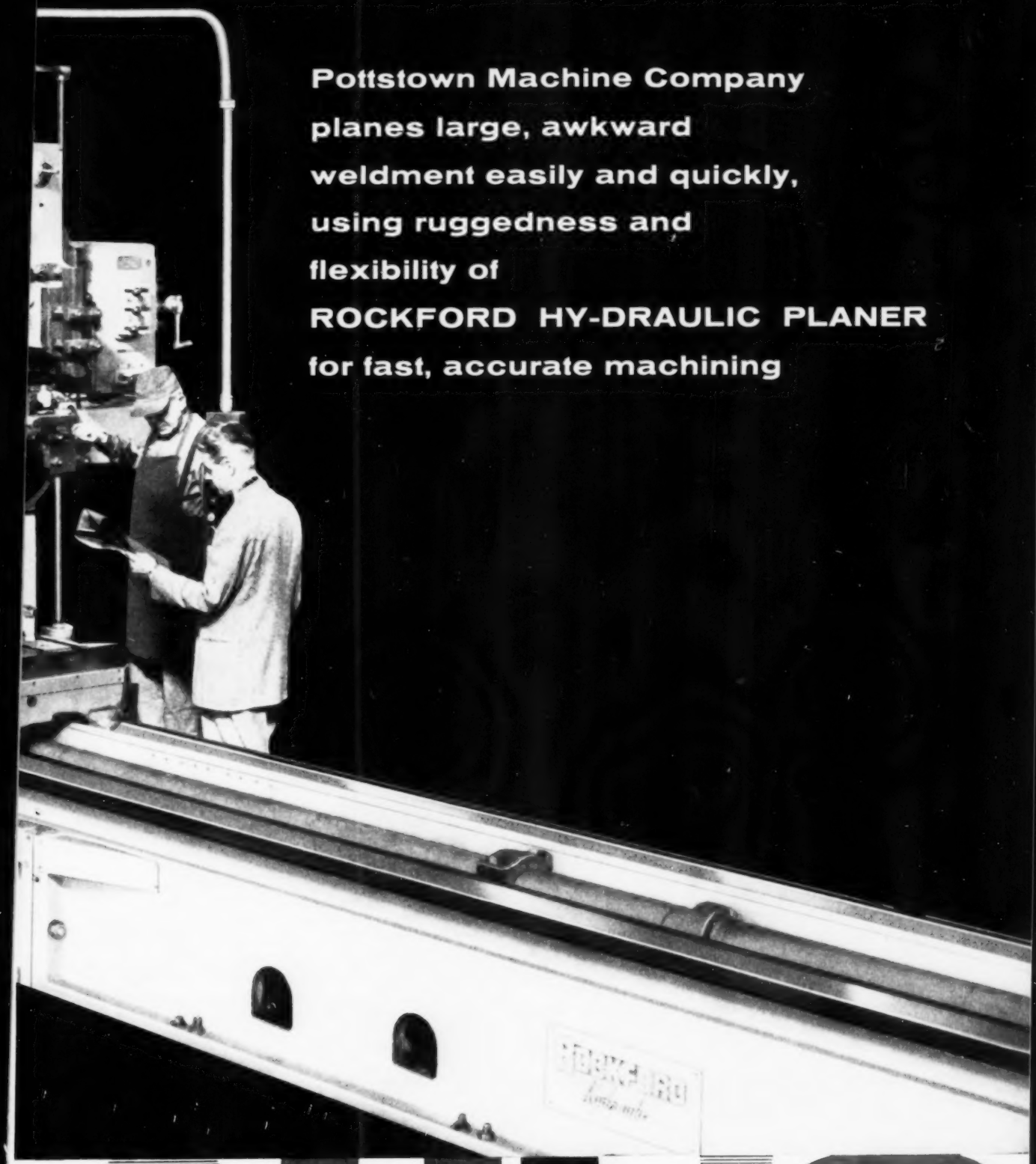
Monarch
TURNING MACHINES
For a better turn faster
. . . Turn to Monarch

THE MONARCH MACHINE TOOL COMPANY, Sidney, Ohio

CIRCLE 219 READER SERVICE CARD

h
HYDRAULIC
ROCKFORD MACHINE TOOL CO. 2500 KISHWAUKEE STREET ROCKFORD, ILLINOIS
HY-DR

THIS HANGOVER IS NOT A HEADACHE!



Pottstown Machine Company planes large, awkward weldment easily and quickly, using ruggedness and flexibility of ROCKFORD HY-DRAULIC PLANER for fast, accurate machining

AULIC

How Warren Pouyer cut grinding

Six years as a tool and die maker gave Bay State's Warren Pouyer a basic knowledge of precise metal working problems that many an "expert" would envy. For the last nine years, he has specialized in abrasives and has gained a tremendously wide knowledge of grinding methods and materials.

Moog operator gets heavy, rapid stock removal using Bay State wheel to grind eye of automobile spring leaf.

costs 1/3 at Moog Industries

Too many wheels were being used up too fast. That was the basic problem in the spring eye grinding operation at Moog Industries, St. Louis, Mo. A leading manufacturer of truck, trailer and automobile springs, Moog makes a complete line of front-end, chassis parts . . . and in this highly competitive business, keeping grinding costs down is vitally important.

So they called in Warren Pouyer of Bay State distributor Mill Supply & Machinery Company and he spotted the trouble right off the bat: disc grinding wheels of a specification that looked as if it *ought* to be right but wasn't. Pouyer specified the proper Bay State wheel using a semi-friable type of aluminum oxide with a unique combination of grit sizes. Production increased 33% per wheel without loss of operation speed.

Since then, the Bay State wheel has been competitively tested over and over again and it has come out on top every time . . . a tribute to Warren Pouyer's ability to specify exactly the right wheel, in this case the first time, and to Bay State's ability to reproduce a given spec *exactly* and *consistently*.

Warren Pouyer doesn't solve all his grinding problems as quickly as this. Like all Bay State representatives, he's trained to study every problem *thoroughly*. And whether a particular problem has a simple solution or a tricky one, you can be sure *your* Bay State man will stick to it until he works out a practical, economical answer. *Better grinding at lower cost—that is his business.*

BAY STATE WHEELS OF PROGRESS

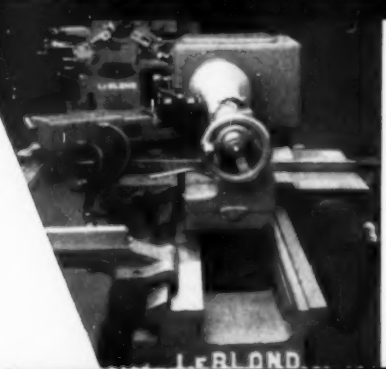
BAY STATE ABRASIVES

Bay State Abrasive Products Co., Westboro, Massachusetts.
In Canada: Bay State Abrasive Products Co., (Canada) Ltd., Brantford, Ontario.
Branch Offices: Bristol, Conn., Chicago, Cleveland, Detroit, Pittsburgh. *Distributors:* All principal cities.

New Tracer? Yes!

SIMPLICITY ITSELF! All parts mount on lathe, need no extra floor space. Set-up takes less than 15 minutes. Short hoses are located out of operator's way.

LOCKED-CIRCUIT VALVE is secret of responsive operation. Precision plunger fits to .0001". Valve maintains constant accuracy, does not heat up in operation.



All new* from LeBlond

REGAL-TRACE

**New principle, new design, new convenience, new price—as low as $2760!*

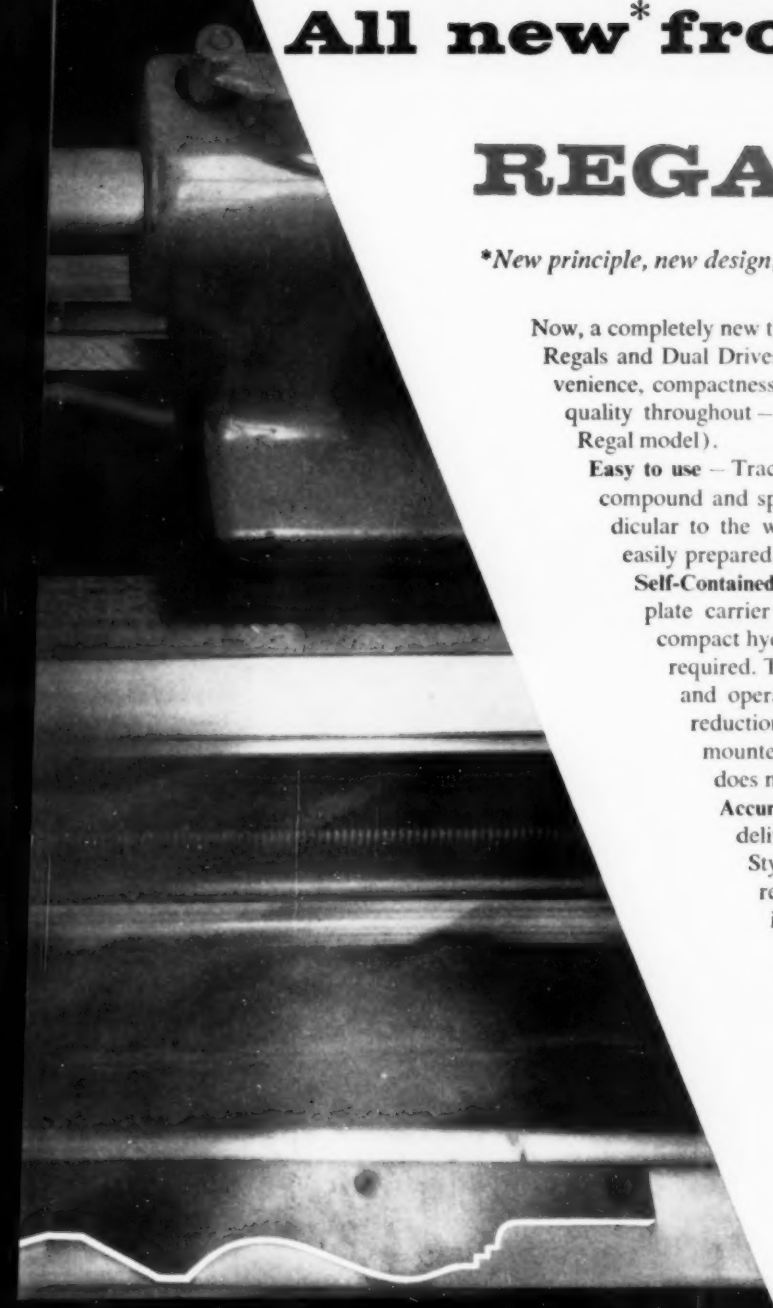
Now, a completely new tracer unit designed exclusively for famous LeBlond Regals and Dual Drives. Regal-Trace! Engineered from the start for convenience, compactness, responsiveness, precision and economy. LeBlond quality throughout – and new low prices beginning at $2760 (for 13" Regal model).

Easy to use – Traces radii, stepped shafts, contour faces, tapers, compound and spherical curves. Swivels 45° either side of perpendicular to the work. Cuts toward or away from headstock. Uses easily prepared flat templates.

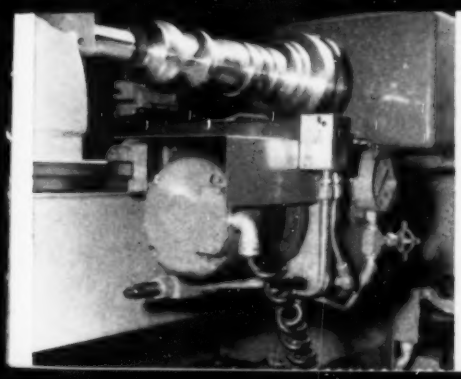
Self-Contained – Only 4 major parts: tracer unit, power unit, template carrier and bed bracket assembly. All parts, including compact hydraulic system mount on lathe. No extra floor space required. Tracer unit replaces compound rest, can be installed and operating (or removed) in less than 15 minutes. No reduction whatever in swing capacity. Permanently rear-mounted hydraulic unit becomes integral part of machine, does not interfere with normal lathe operation.

Accurate, smooth, fast – Locked-circuit hydraulic system delivers a new degree or responsiveness and precision. Stylus pressure less than one pound. Will consistently reproduce parts to accuracy of ± .0005". Pressure is maintained at 300 psi (or higher if desired). Hydraulic cylinder provides feed rate of 75 in. per minute. Unique valve unit is preset at factory, requires no adjustment.

Fits any LeBlond Regal built since 1955 and all Dual Drives. Can be installed in the field or purchased as original equipment on new lathes. Write today for complete information and specifications on the all-new LeBlond Regal-Trace or see your LeBlond Distributor.



COMPACT HYDRAULIC UNIT mounts permanently at rear, does not interfere with normal lathe operation. Includes oil reservoir, pump, motor, relief valve.



EASILY PREPARED flat templates mount conveniently at front of lathe, are easily stored between jobs. Straight template or straight edge used for turning tapers.

LeBLOND *of Cincinnati*

...cut with confidence

The R. K. LeBlond Machine Tool Co.

Cincinnati 8, Ohio

World's Largest Builder of a Complete Line of Lathes for More Than 72 Years

WILSON "ROCKWELL"

HARDNESS TESTERS

WORLD'S STANDARD OF ACCURACY

ACCO for Better Values

EQUIPMENT for EVERY Hardness Testing Requirement

No matter what your hardness testing requirements are, there's a WILSON "ROCKWELL" instrument to do the job. Choose from this complete selection of hardness testers:

"ROCKWELL"—for most hardness testing functions.

Superficial—for extremely shallow indentations.

Twintester—combines functions of "ROCKWELL" and "ROCKWELL" Superficial testers.

Semi-Automatic (manual feed) and Fully Automatic—for automatically classifying tested pieces as CORRECT, TOO HARD, or TOO SOFT—at test rates up to 1000 pieces per hour.

Special Machines—for testing large objects, obtaining internal readings, and other unusual applications.

ALL WILSON "ROCKWELL" hardness testers provide these advantages:

Accurate performance—precision built, with exact calibration, for consistently correct results.

Long life—durable as a machine tool.

Easy operation—even an unskilled operator can get perfect readings. All controls conveniently grouped.

Easy maintenance—interchangeable mechanisms, with spindles mounted on oil-less bearings.

DIAMOND "BRALE" PENETRATORS

for perfect testing every time

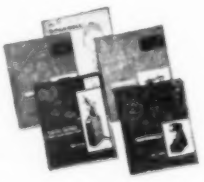
A perfect diamond penetrator is essential to accurate hardness testing. Since one point of hardness on the "ROCKWELL" scale represents only 80 millionths of an inch of penetration—only 40 millionths on a Superficial tester—the slightest imperfection will cause a false reading.

Only *perfect* Wilson Diamond Brale Penetrators are sold. Each diamond is flawless, with no chips or cracks. It's cut to an exact shape. Microscopic inspection and a comparator check of every diamond—one at a time—assure this perfection—and assure you of accurate hardness testing every time.

A COMPLETE LIBRARY of Helpful Information

A wide variety of bulletins tells about hardness testing, and describes the many instruments, accessories, and services Wilson offers. Write for your choice:

DH-325—WILSON "ROCKWELL" Hardness Testers • **DH-326**—"ROCKWELL" Superficial Hardness Testers • **DH-327**—Special "ROCKWELL" Testers, including Automatic and Semi-Automatic models • **DH-328**—TUKON Tester, for precision MICRO and MACRO testing



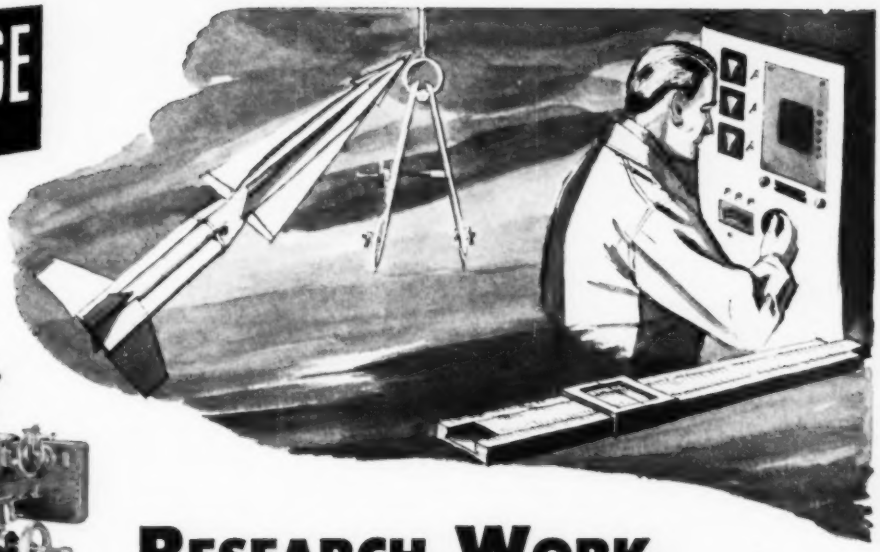
ACCO **WILSON**

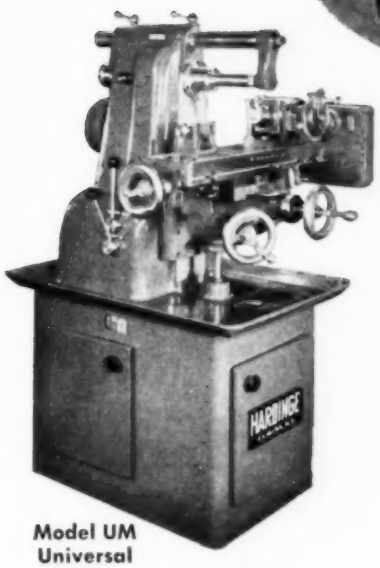
MECHANICAL INSTRUMENT DIVISION

AMERICAN CHAIN & CABLE

230-B Park Avenue, New York 17, N.Y.

HARDINGE
ELMIRA, N.Y.



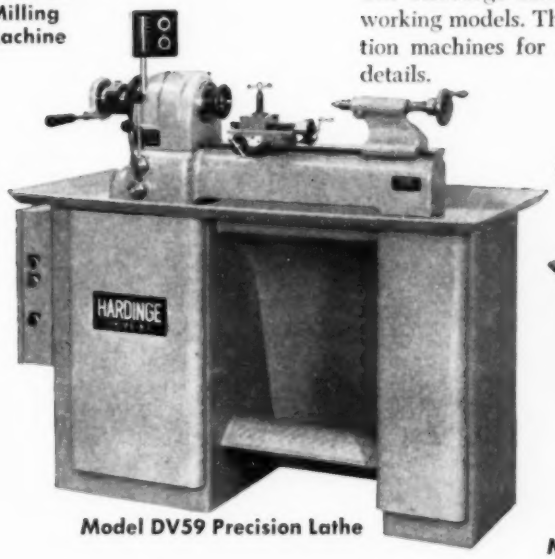


Model UM
Universal
Milling
Machine

RESEARCH WORK
Demands
THE BEST IN MACHINE TOOLS

HARDINGE is the only manufacturer of companion precision machines for milling, straight turning, taper turning, boring, threading and facing with the feature of interchangeable collets, nose fixtures and attachments.

The Hardinge machines illustrated produce precision parts for working models. There are also three Hardinge precision production machines for high speed volume manufacturing – ask for details.



Model DV59 Precision Lathe

Model HLV High Speed
Tool Room Lathe

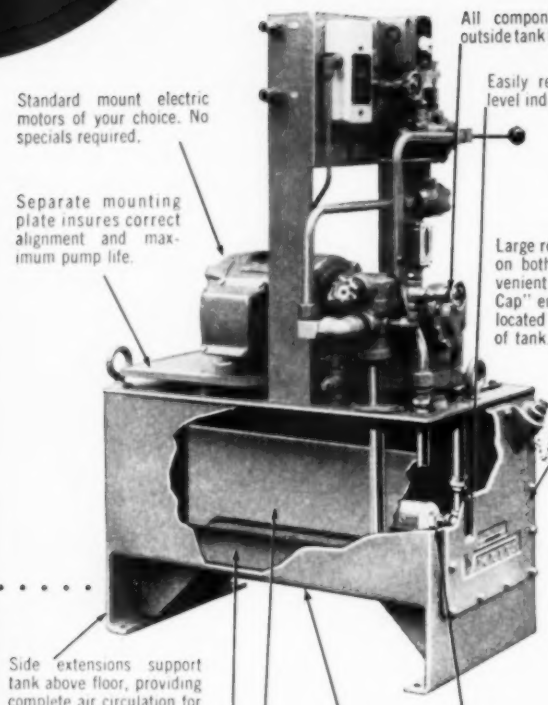
SPECIFICATIONS: *The UM Universal Milling Machine has cutter spindle and spiral dividing head collet capacity of 1-1/16" and a 25 x 6-1/2" swivel table. The DV59 Precision Lathe has 1-1/16" capacity and 9" swing with 17" between centers distance. The HLV Tool Room Lathe has 1-1/16" capacity and 11" swing with 18" between centers distance.*

HARDINGE BROTHERS, INC., ELMIRA, N. Y.

PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE

You save money and time applying Hydraulics when you buy the . . .

VICKERS *package . . . . . instead of parts*

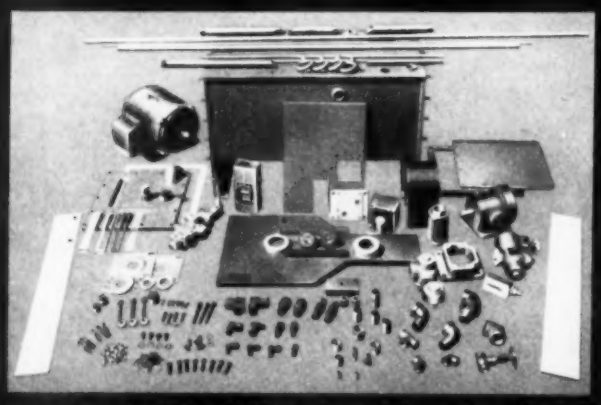

All components mounted outside tank for easy access.
Easily read accurate fluid level indicator.
Standard mount electric motors of your choice. No specials required.
Separate mounting plate insures correct alignment and maximum pump life.
Large removable covers on both ends for convenient cleaning. "Filler Cap" end cover can be located at either end of tank.
Side extensions support tank above floor, providing complete air circulation for maximum heat rejection.
Corrosion protection—internal tank surfaces sand blasted and specially painted.
Inlet strainers can be removed and cleaned without disconnecting components or pressure piping.
New baffle plate improves fluid circulation.
Easy accessibility to drain plug.

Vickers Custom Built Power Package . . . complete . . . factory pretested . . . ready to connect and operate.

You save time and expense of design, layout, multiple purchasing, and assembly when you buy the Vickers package. You are assured of component compatibility and Vickers undivided responsibility and guarantee for the entire hydraulic package.

A Vickers Custom Built Hydraulic Power Package is a "complete unit" . . . factory pretested, ready for you to connect and operate. Designed and professionally built to your specifications.

Call in a Vickers Application Engineer or write for Bulletin 5001B.



These parts are required to build the Power Package shown above. Purchasing the complete package from Vickers saves you the time and cost of design, assembly, and testing. It also assures the most suitable unit for your particular requirements.

VICKERS INCORPORATED
DIVISION OF SPERRY RAND CORPORATION
Machinery Hydraulics Division
ADMINISTRATIVE and ENGINEERING CENTER
Department 1410 • Detroit 32, Michigan

Application Engineering Offices: ATLANTA • CHICAGO* • CINCINNATI • CLEVELAND • DETROIT* • GRAND RAPIDS • HOUSTON • INDIANAPOLIS • LOS ANGELES AREA (El Segundo)* • MILWAUKEE • MINNEAPOLIS • NEW YORK AREA (Springfield, N.J.)* • PHILADELPHIA AREA (Media) • PITTSBURGH AREA (Mt. Lebanon) • PORTLAND, ORE. • ROCHESTER • ROCKFORD • SAN FRANCISCO AREA (Berkeley) • SEATTLE* • ST. LOUIS • TULSA • WORCESTER • Factories also in: Australia, England, Japan and Germany • In Canada: Vickers-Sperry of Canada, Ltd., Toronto,* Montreal and Vancouver
Field Service Headquarters Underlined. Whse. Stock & Repair Branches*.

8155

ENGINEERS AND BUILDERS OF OIL HYDRAULIC EQUIPMENT SINCE 1921

IT PAYS TO STANDARDIZE ON **STANSCREW**

Machine Bolts and Carriage Bolts Now Produced to Stanscrew Quality Standards

Stanscrew presents a new line . . . carriage and hex machine bolts . . . now produced and stocked in a complete selection of more than 500 different sizes. Manufactured under careful quality control methods, they meet the same standards of uniformity and dependability which have made other Stanscrew fasteners a leading choice of American industry for over 80 years.

These new additions bring Stanscrew's complete line to over 5,000 different types and sizes of standard, catalogued fasteners. From this comprehensive selection you can find dependable, economical answers to the overwhelming majority of all your fastener needs.

Your Stanscrew fastener specialist, available through your nearby Stanscrew distributor, can show you many ways these inexpensive standard items will cut your product costs . . . for example, by replacing costly special fasteners.

Each of the over 5,000 different Stanscrew fasteners is always kept in stock at three conveniently located plants. This enables your Stanscrew distributor to provide faster service . . . to be particularly helpful in emergency situations where prompt delivery can mean substantial savings.

So, whatever your fastener requirements, just call your nearby Stanscrew distributor. Or for complete information on Stanscrew's new carriage and machine bolts, simply mail the coupon below.

STANSCREW FASTENERS

STANDARD SCREW COMPANY

CHICAGO | THE CHICAGO SCREW COMPANY, BELLWOOD, ILLINOIS

HMS | HARTFORD MACHINE SCREW COMPANY, HARTFORD, CONNECTICUT

WESTERN | THE WESTERN AUTOMATIC MACHINE SCREW COMPANY, ELYRIA, OHIO

Standard Screw Company
2701 Washington Blvd.
Bellwood, Illinois

Please forward complete information on

☐ Machine bolts ☐ Carriage bolts

Name_____ Title_____

Company_____

Address_____

City_____ State_____

◄ CIRCLE 228 READER SERVICE CARD

CIRCLE 229 READER SERVICE CARD

Time-Saving • Money-Saving

STANDARD BROACHES FROM LOCAL STOCKS

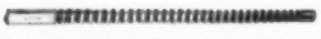
CUT A KEYWAY IN ONE MINUTE

In one minute and for as little as one cent you can cut a keyway with the Minute Man Keyway Broach Kit. For keyways from 1/16" to 1" in any bore from 3/4" to 3"

FINISH HOLES TO EXACT SIZE IN ONE PASS

Minute Man

SQUARE BROACHES — 1/8" to 3/4" holes



HEXAGON BROACHES — 1/8" to 3/4" holes

ROUND BROACHES — 1/4" to 1" holes

SEND FOR CATALOG AND PRICE LIST

The duMont Corp.
Greenfield, Mass.

MAIL FREE BROACH CATALOG AND PRICE LIST A describing Square Broaches, Hexagon Broaches, Production Type Keyway Broaches and Keyway Broach Kits to

Name.....

Company.....

Address.....

duMont

Letters...

To American Machinist
330 W 42nd St, NY 36, NY

Needle sharpener

Dear Sirs:
On your "Spot News" page you ran an item about "Fine grinding of thin sharply pointed objects. . . ." (*AM*—Sept 22 '58, p73).

This is very interesting to me, and I would like to know if you could furnish more information on the subject.

Who is doing the development, and who could give me more details?

Ben Y Morris
Enka, NC

This news item came from our London correspondent who tells us the device is a Russian development. So far, we have been unable to learn any more about it than the information you read in "Spot News"—Ed.

Tape control

Dear Sirs:
Re: the new Micro-Path machine tool control mentioned on your "Aircraft and Missiles" page (*AM*—Dec 15 '58, p75).

Will you kindly send to the attention of the writer additional information such as the address of Topp Industries.

A E Watson
Morton Grove, Ill

Dear Sirs:
We would appreciate receiving complete information on Micro-Path machine tool controls . . .

L D Chandler
Montreal, PQ, Canada

More information can be found in our "New Equipment Dept (AM—Dec 29 '58, p74), or from Micro-Path, Inc, subsidiary of Topp Industries, Inc, 4949 West 104th St, Inglewood 2, Calif—Ed.

Suggestions

Dear Sirs:
I noticed in your "Talking Shop" page a reference to the National Association of Suggestion Systems (*AM*—Sept 22 '58, p129).

Would you please send me their mailing address and any information you may have concerning their organization?

Duke Tyler Scott
Chattanooga, Tenn

This association is composed of

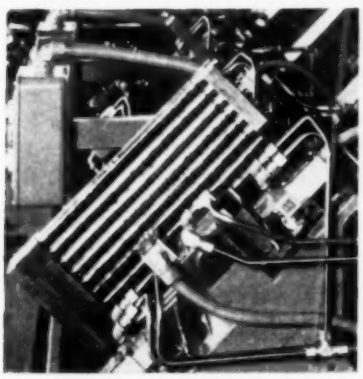
SHOPMATES

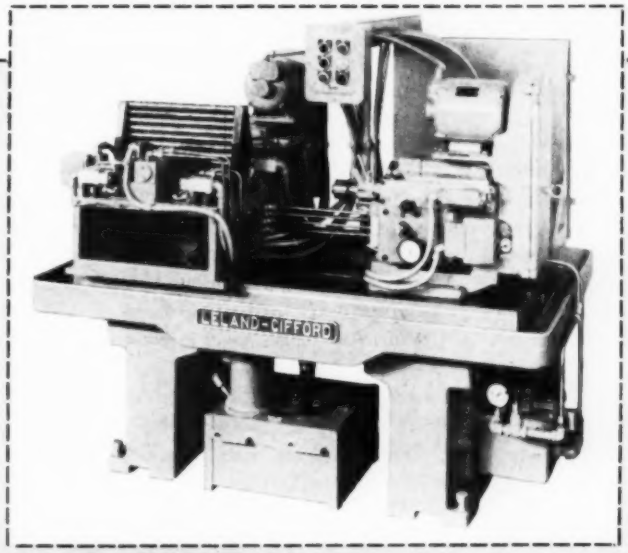
N. Jarvis

HE GOOFED ON THAT UNDERCUT AND SPENDS THE NOON HOUR TRYIN' TO WELD IT UP!
HE'S JUST DUMB ENOUGH TO MAKE MISTAKES.... AND JUST SMART ENOUGH TO HIDE 'EM!!

New patterns for profits...

When hand operations are replaced by high speed mechanized methods, you benefit with lower costs, higher production, better quality control. In production drilling, Leland-Gifford is the best source for sound, economical and effective solutions.





STEP 1 ▲

Hopper feed 4-station deep hole drilling unit. Each station automatically loads, positions and drills 3/16″ x 5.860″ hole in automatic transmission part. Discharge to conveyor at 100 pcs. per hour.

STEP 2 ▶

Convey to second unit, drill small cross hole to meet deep hole and ream deep hole. Eject to conveyor at 200 pcs. per hour.

Call in your nearby Leland-Gifford sales engineer.

LELAND-GIFFORD
SPECIAL
DRILLING MACHINES

WORCESTER 1, MASSACHUSETTS, U.S.A.

Chicago 45
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New York Office
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2620 Leonis Blvd.
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Indianapolis 6, P. O. Box 1051

Rochester 12, P. O. Box 24, Charlotte Station

companies operating employee suggestion systems. Members include manufacturers, transportation companies, public utilities, financial institutions, and others. The address is 25 E Jackson Boulevard, Chicago 4, Ill (G E Washburn, Secretary)—Ed.

Spiral-point drilling

Dear Sirs:

In your Special Report No. 466, "Plan '59," you included a section on drilling (*AM*—Oct 20 '58, pM10). I note that reference is made to spiral-point drill sharpening in this section.

As repetition drilling is carried out in our works, this is of considerable interest to us, and local inquiries could give us no information on the subject.

Could you furnish any information on this spiral drill pointing?

R Hosie
Dandenog, Victoria, Australia

The spiral-point drill is a relatively new concept in drilling. The geometry of the point is quite different from the conventional chisel-point drill, and it is ground on the Spiromatic grinder manufactured by Cincinnati Lathe & Tool Co.

An article in American Machinist *covered the announcement of the new drill and described how it operates (AM—Oct 21 '57, p194). For further information, we suggest you contact Cincinnati Lathe & Tool Co, Disney & Rodgers Sts, Cincinnati 9, Ohio*—Ed.

"Take the diameter down about .003 and make it five feet longer."

IMMEDIATE DELIVERY

Van Keuren WIRE TYPE PLUG GAGES

WIRE TYPE (REVERSIBLE) PLUG GAGES were originated by **THE VAN KEUREN CO.** in 1923, and since that time have been supplied to an ever expanding group of manufacturing concerns throughout the country and abroad. The wire type design has enjoyed tremendous popularity because of the inherent economy represented by the fact that the gage units can be reversed, or cut off, to obtain substantial increase in gage life.

As a result of our long experience in developing and pioneering the manufacture of wire type plug gages and the sale of millions of these units, we have come to know what sizes will be required during a given period of time, and have prepared ourselves by finishing in advance a multitude of units which are in constant readiness for shipment. Our methods of size prediction through research and sales analysis have been successful to the point that there is now better than a four out of five chance that at any time we will have on hand the gage or gages that you need. In addition improved and highly efficient methods of manufacture developed during the years of our work in this field make possible the manufacture, to your requirement, of any size not on hand, in an incredibly short time.

VAN KEUREN WIRE TYPE PLUG GAGES are made to the most exacting requirements as to diameter, roundness, hardness, stability and surface finish. They are offered in all tolerances from XXX (.00001") to ZZ, and are available as units, in handles, or in sets.

Send for a copy of the new, 258-page Van Keuren Catalog and Handbook No. 36 containing valuable technical and engineering information on measuring problems and methods. Address:

VK
39th YEAR

THE *Van Keuren* CO.,
173 WALTHAM STREET, WATERTOWN, MASS.

Optical Flats . . . Light Wave Equipment . . . Light Wave Micrometers . . .
Gage Blocks . . . Wire Type, Taperlock and Trilock Plug Gages . . . Master Setting Disks . . . Thread Measuring Wires . . . Gear Measuring Wires . . .
Carbide Plug Gages . . . Carbide Pivots . . . Precision Lapping Service

CALENDAR

American Society of Mechanical Engineers — Aviation Conference. Mar 8-12, Statler-Hilton Hotel, Los Angeles, Calif

Pressed Metal Institute—Spring Technical Meeting, Mar 11-13, Pick-Congress Hotel, Chicago.

American Society for Metals — Western Metal Exposition and Congress, Mar 16-20, Pan-Pacific Auditorium and Ambassador Hotel, Los Angeles, Calif.

American Machine Tool Distributors Association—Spring Meeting, Mar 17-19, Sheraton Park Hotel, Washington, DC.

Investment Casting Institute—Annual Meeting, Mar 17-19, Santa Monica, Calif.

Society of Automotive Engineers —National Production Meeting, Mar 19-20, Sheraton-Cadillac Hotel, Detroit, Mich.

Society of Automotive Engineers —National Aeronautic Meeting, Production Forum, and Display, Mar 31-Apr 3, Hotel Commodore, New York, NY

American Welding Society—Annual Meeting and Exposition, Apr 6-10, Sherman Hotel and Donovan Hall, Chicago, Ill.

American Foundrymens Society—Engineered Castings Show, Apr 13-17, Sherman and Morrison Hotels, Chicago, Ill.

American Society of Tool Engineers—Annual Meeting, Apr 18-22, Schroeder Hotel, Milwaukee.

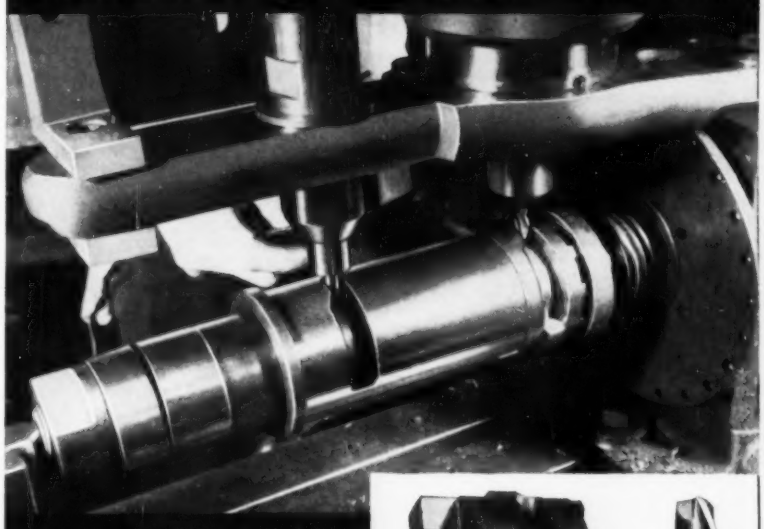
Metal Powder Industries Federation—Annual Meeting and Powder Metallurgy Show, Apr 20-22, Sheraton-Cadillac Hotel, Detroit, Mich.

Metal Treating Institute—Spring Meeting, Apr 23-25, Hollywood Beach Hotel, Hollywood, Calif.

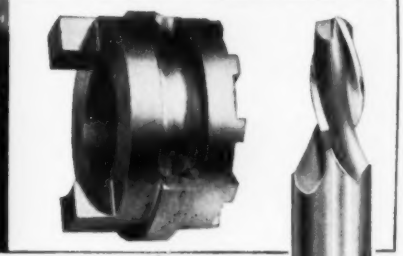
National Screw Machine Products Association — Annual Meeting, Apr 26-29, Roosevelt Hotel, New York, NY.

Grinding Wheel Institute & Abrasive Grain Association — Semi-Annual Meeting, Apr 27-29, The Homestead, Hot Springs, Va.

'Standard' off-the-shelf End Mill



Speeds Production, Speeds Delivery of Machine Tool Clutch!



Machine tool clutch showing cam track milled with "Standard" Brown & Sharpe End Mill.

½" "Standard" Brown & Sharpe High Speed double-end End Mill.

One of the 72, yes *seventy-two*, different Brown & Sharpe ½" End Mills that cut production days and add dollars of production profits to this job.

Operation: On tracer-controlled milling machine—plunge cut and peripheral mill a cam track contour in special, extra tough alloy steel machine tool clutch.

Choose the correct Brown & Sharpe End Mill from the World's Largest Stock of "Standards" and start production.

Eliminate days of waiting for special tools—eliminate trial and error of unproved tools—with Brown & Sharpe PRODUCTIONEERED CUTTERS!

Send for Catalog showing more than *3400* "Standard" Brown & Sharpe Milling Cutters to: *Cutting Tool Division, Brown & Sharpe Manufacturing Company, Providence 1, Rhode Island.*

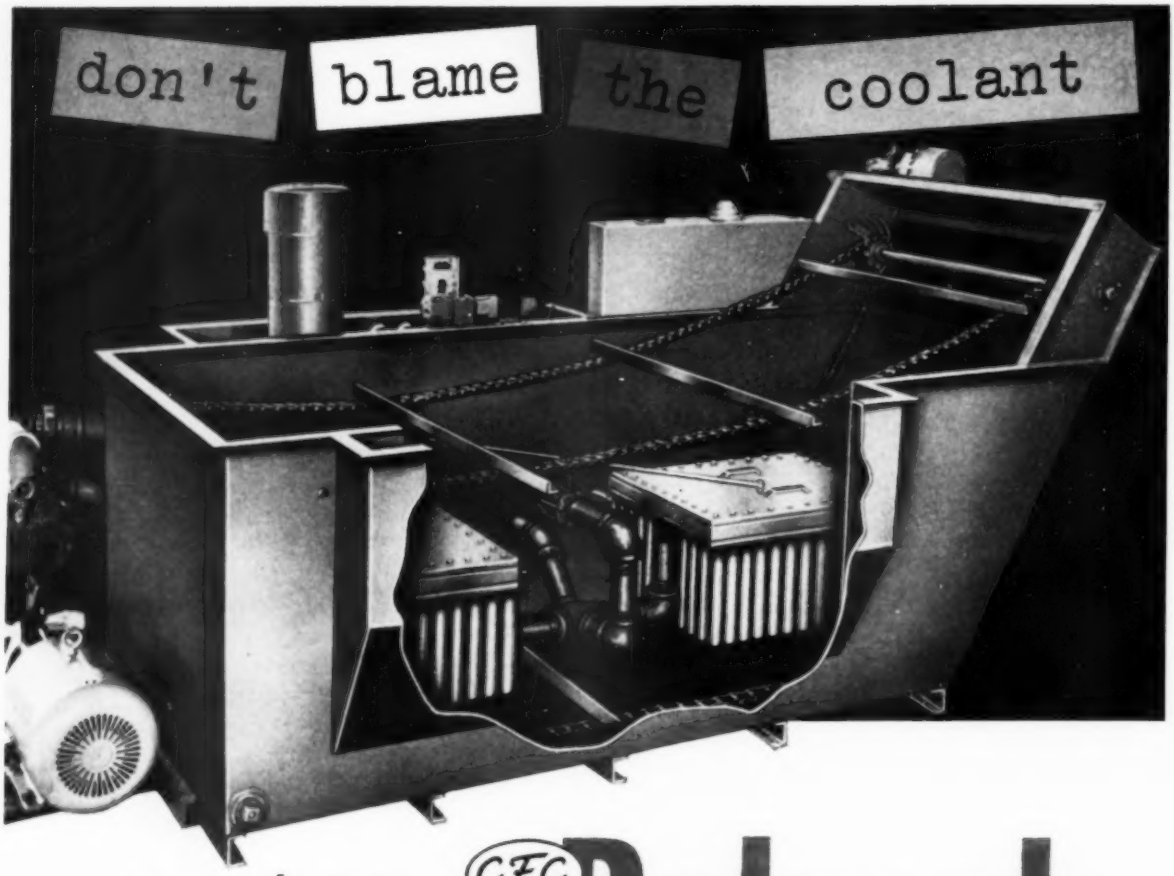
FOR THAT EXTRA EDGE IN PRODUCTION

Brown & Sharpe

CUTTING TOOL DIVISION

HIGH SPEED STEEL CUTTERS
NELCO CARBIDE TOOLS
END MILLS

PROGRESS IN PRECISION FOR OVER 125 YEARS



assure longer life, better quality with

CFC Delpark

FILTER-MATIC

If dirty coolant is fouling up your work, the CFC Delpark Filter-Matic may be the simple remedy.

Delpark Filter-Matic keeps coolants clean, protects both machine tools and process work. You save money through longer coolant life.

CFC Delpark Filter-Matic gives *constant vacuum filtration* of coolants, cutting oils, rolling oils, solvents and other fluids. Dual manifold design allows uninterrupted filtration — one manifold on filtering cycle while the other is on backwash or cleaning. Pre-coat filter aids may be used to give absolute filtration.

Write for technical literature to Dep't **AM**

COMMERCIAL FILTERS CORPORATION
MELROSE 76, MASSACHUSETTS
PLANTS IN MELROSE, MASSACHUSETTS AND LEBANON, INDIANA

MICRO-CLARITY AT MINIMUM COST

Fulflo Filters — *with genuine Honeycomb Filter Tubes for controlled micro-clarity of industrial fluids.*

CFC Filters — *Selective filtration of oils • water-oil separators • magnetic separators • pre-coat filters • coolant clarifiers • automatic tubular conveyors.*

CIRCLE 234 READER SERVICE CARD

CIRCLE 235 READER SERVICE CARD ►

Announcing

Another New Cutting Tool for DoALL Band Machines

NEW DIAMOND EDGE BLADE

For straight or contour cutting

Abrasive Plastics	Granite
Alundum	Hard Carbons
Ceramics	Hi-Temp Alloys
Epoxy	Semiconductors
Fiberglas	Super Alloys

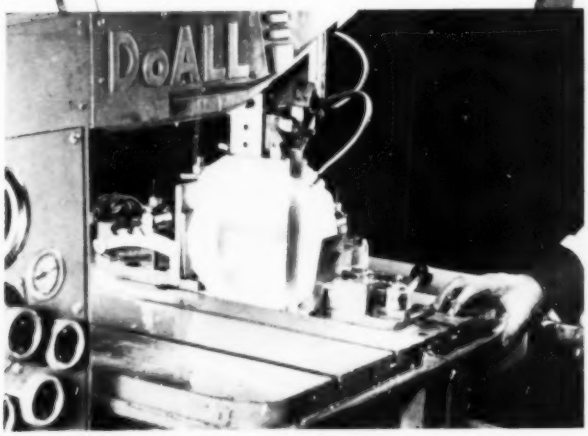
To order, give desired width and length.

Price—$36.00 per foot.

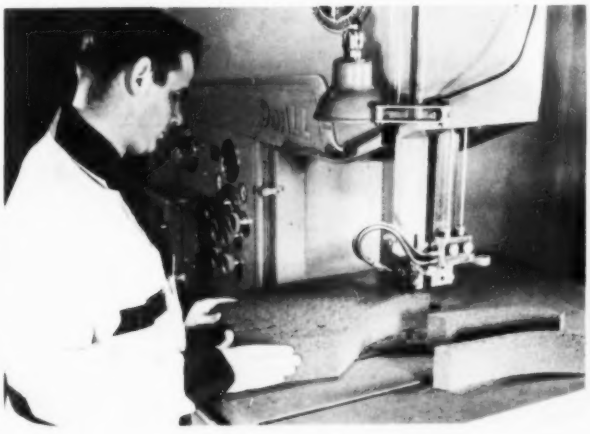
This new diamond edge blade named the Dia-Chrome contains a uniformly high concentration of diamonds, held to the cutting edge of the band by a special chrome-plating process that prevents chipping or peeling as it flexes over the saw carrier wheels, operating at a tool velocity between 2 and 3 thousand feet per minute. The vertical straight-line cutting action permits mortising and angular cuts to be made in heavy sections, impossible by other methods.

It provides exceptionally fast cutting rates, unequaled accuracy for parallelism, flatness and finish of cut. Typical is the cutting of black granite at 8 to 15 sq. in. per minute, Fiberglas at 6 to 12 sq. in. per minute and hard carbons at 8 to 16 sq. in. per minute. The diamond edge blade expands the proven advantage of band machining to the new hard-to-cut materials.

Continuous research and development in band tools to cut and shape materials is the "DoALL Pledge" assuring optimum performance from band machining. This is an important pledge because unlike other machine tools there must be compatibility between machine and tool to work as a team in order to achieve top performance.

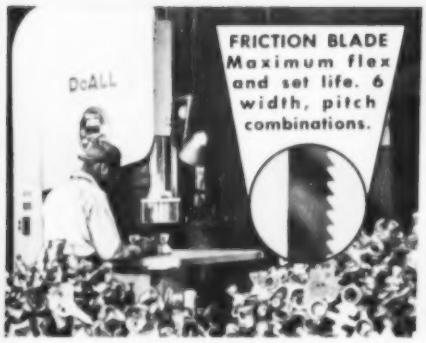


The Contour-matic® band machine has the controlled feed and the recirculating coolant system to get top performance from this new cutting tool.



Granite cut at 8 to 15 sq. in. per minute. Angles, bevels and contours present no problems. You can depend upon unequaled accuracy and fine finish.

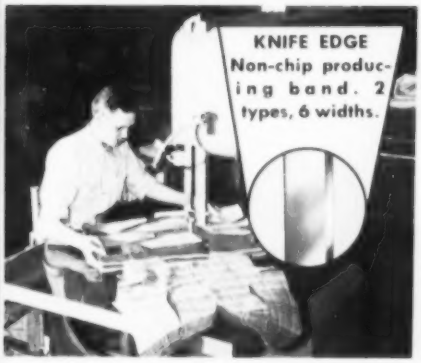
BETTER SAWING on Every Job!!



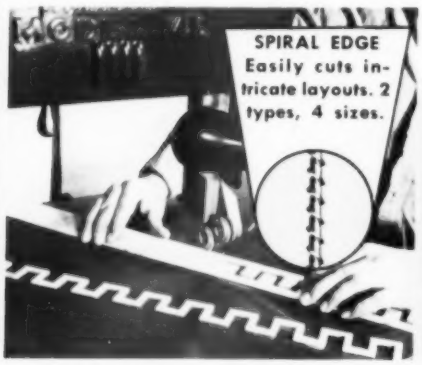
ZEPHYR and FRICTION BLADE
Trimming high chrome-nickel castings—at cutting rate of 2 seconds per cut—blade life 14,400 cuts.

POWER SAW and DEMON BLADE
Cutting off Alnico 32 RC at a cutting rate of 3.44 sq. in. per min.—blade life 6000 sq. in.

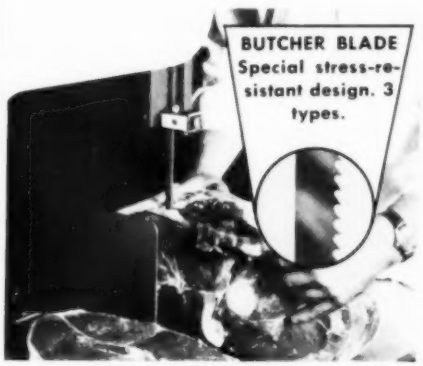
CONTOUR-MATIC and CLAW TOOTH
Shape sawing aluminum at cutting rate of 35 sq. in. per min.—blade life 8000 sq. in.



KNIFE EDGE BLADE
Combines accuracy and speed in mass-production cutting of fabrics on DoALL cloth-cutting machine.



SPIRAL EDGE BLADE
The 360° cutting edge provides omnidirectional cutting on the Contour sawing machine.



BUTCHER BLADE on MEAT SAW
Cuts meat, poultry, fish and other food products fast and clean without smear.

POLISHING BAND
Fine finishing of parts on Contour machine is fast and accurate.

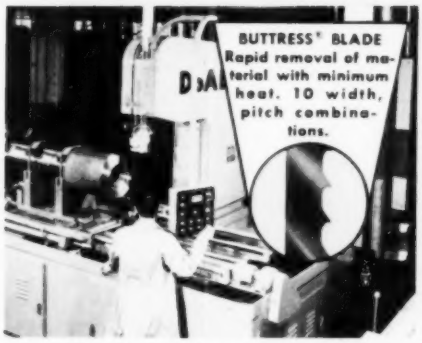
THE SOURCE OF GOOD PERFORMANCE

The 50,000 DoALL sawing machines in use today have created a substantial market for saw blades and it is a challenge for manufacturers to try to invade the blade market that has been opened by these machines. As frequently happens, some manufacturers take the course of offering facsimiles at a few pennies less in price but much less in productivity and life. DoALL is the largest manufacturer of both band saw blades and sawing machines, and this single responsibility for sawing performance is a guarantee that only DoALL can offer its users. The DoALL organization is concerned with user satisfaction and user reliance on DoALL machine performance.

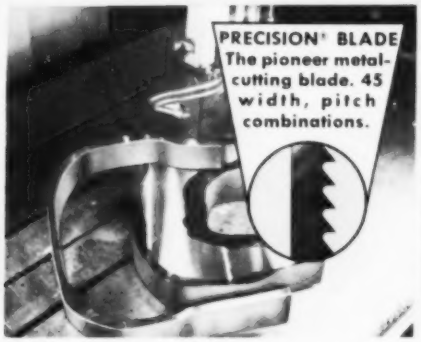
THE NEED FOR CONTINUOUS INSTRUCTION

Recent advances made in metal sawing have brought many new concepts for manufacturing. To introduce these new techniques, DoALL specialists are factory-trained. They work with users on their specific machining problems. This staff of sales engineers and another staff of service engineers are trained to approach machining problems with the band saw blade and machine as one integral unit. The service of these men costs nothing to users because their pay is in the sale of *genuine* DoALL *products*. It is this unity of DoALL blade and machine that accounts for maximum cost-reducing performance. We solicit your inquiries and the opportunity to prove our sawing performance. Call or write your local DoALL store.

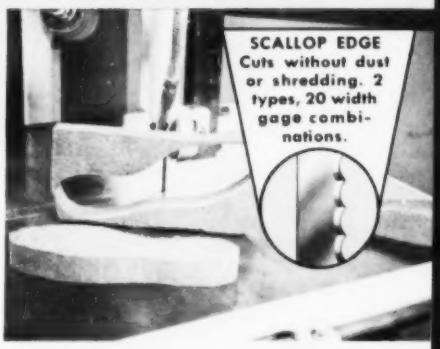
Your Galaxy of DoALL Band Tools from The Leader in New Saw Developments



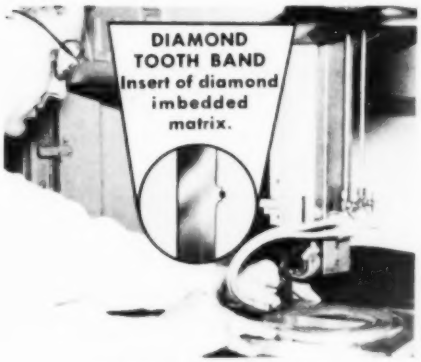
BAND MILL and BUTTRESS BLADE
Slicing AISI 1050 leaded at a cutting rate of 7 sq. in. per min.—blade life 4000 sq. in.



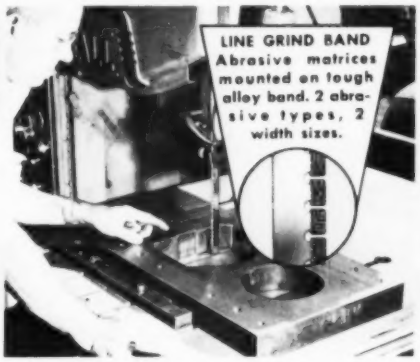
CONTOUR MACHINE and PRECISION BLADE
Slices through mild steel at a rate of 1½ sq. in. per min. in shaping tools and dies.



ZEPHYR and SCALLOP EDGE BLADE
Slices through low-density materials—rubber, felt, cork, leather, etc.—without tearing, shredding or producing dust or dirt.



DIAMOND TOOTH BAND
Makes possible the efficient cutting of friable materials on a Contour-matic.



LINE GRIND BAND
Permits cutting of hardened steels on a Contour-matic machine.

PICA-MASTER BLADE and MACHINE
This combination accurately trims printing slugs and engravings.

FILE BAND
Is more accurate and 9 times faster than hand filing.

See the "Cutting Edge"

Traveling Educational Exhibit

This illustrated program of latest technology on chip formation is booked for showing at ASTE and ASME societies throughout 1959. Plan to attend when it is in your area.

4 Reasons for Greater Value in DoALL Cutting Tools!

Our Tool Inspection

Test laboratory continually checks quality of DoALL band tools.

Our Research Laboratory

Research laboratory continually tests sawability of all materials.

Our $2,000,000 Inventory

Stocked for immediate delivery—world's greatest selection of band tools.

One of 38 Sales-Service Stores

Local Sales-Service Stores are band saw headquarters in your area.

BUY DoALL TOP TOOL PERFORMANCE

Now, from one nearby reliable source nearly every need for metal working supplies, cutting tools, gages, surface grinders and band saw machine tools can be secured quickly and economically.

Industry benefits four ways from DoALL's greatly expanded program of service.

LOWER COST PURCHASING, FACTORY TRAINED SERVICEMEN AND SALES ENGINEERS, EACH ITEM LABORATORY INSPECTED, CONSISTENT TOP TOOL PERFORMANCE.

IN STOCK

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all laboratory-inspected

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THE DoALL COMPANY
DES PLAINES, ILLINOIS

SB-66

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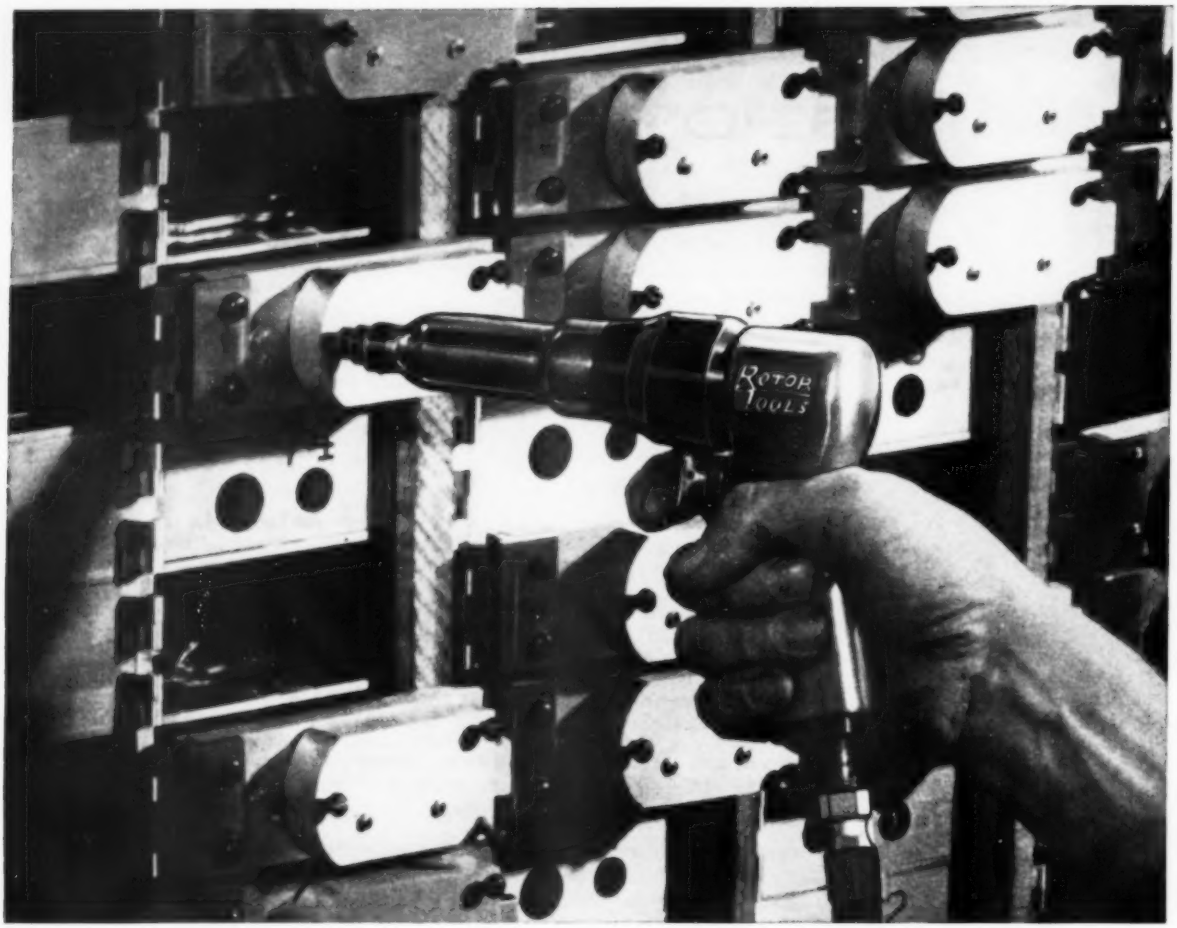
SPOT NEWS...

- **Air Force's "make or buy" ruling** will soon be adopted by all three Services, as Congressional pressure for "more business for small business" mounts. Small Business Administration is pushing for a definite percentage of defense contract work to be subbed out to small firms.
- **First Charles Town-About electric automobile** is slated to come off the line at Stinson Aircraft's San Diego, Calif, plant early in April. The 3-passenger car will have an all-plastic body and an electric motor capable of producing a top speed of 60 mph. Car has a range of 70 to 100 miles, then battery must be recharged. The Town-About will sell for $2800 or $2900. In April, 35 cars will be produced, with 42 slated for May, 44 each in June and July, and 80 a month thereafter.
- **It's definite now that Germany will build the F-104 for the Luftwaffe** under license from Lockheed, which will deliver 100 airframes. Then Germany will set up production lines to build 200 more.
- **Navy's shipbuilding program for the coming year** has no provision for purchase of machine tools, contrasted with this year's (fiscal 1959) budget, which calls for $85 million worth of reserve facilities.
- **Automobile manufacturers now estimate that there will be a steel strike** this year lasting from six to eight weeks.
- **Stainless and alloy steel sheet up to 140 x 360 in.** is now available on a priority basis to aircraft and missile manufacturers from U S Steel through the Air Materiel Command, Wright-Paterson AFB, Ohio.
- **Rigid plastic foam shipping container** also serves as a parts assembly jig and checking fixture for solid fuel rocket engines, Dayton Rubber Co reports. Container has a separate cavity for each part to be shipped, and parts are placed in the cavity as the container goes down the line. Checking consists of seeing each cavity is filled.
- **Are Detroit methods better for missile manufacture** than aircraft industry methods? Auto industry quality control standards, Detroiters say, as applied to Chrysler's Redstone have resulted in a missile that has been fired successfully 35 of 39 times. (See p77.)
- **At least two of Detroit's Big Three will manufacture cars in Argentina** "in the near future," according to Argentine President Frondizi—with Ford and Chrysler as the most likely prospects. Studebaker is already actively negotiating with the Argentine government.
- **Look for early introduction of molded Nylon 6** as a replacement for ferrous and light metal alloys in large castings, ship propellers and gears.
- **U S Steel will investigate** the possibility of using the "sandwich" method of rolling martensitic alloy steels, hot-work die steels and precipitation-hardening steels under contract to the Air Materiel Command. Method consists of boxing alloy steel plates between two heavy carbon steel cover plates, then rolling by conventional methods.
- **Use of sub-zero coolants in machining** will be researched by Convair-San Diego for the Air Force. Plans call for investigating seven types or combinations of coolants at temperatures as low as –150 F.
- **Magnetic coating of flexible backing materials with abrasive particles,** a patented process just developed by Abrasives Co of America, Fort Lee, N J, is expected to increase abrasive wear 50% to 200%. "Magnecoating" process draws magnetically charged particles to adhesive surface of the backing by external magnetic force, assuring that the abrasive's sharpest edge is exposed for cutting.



Cuts screw-driving time 66%

APPLICATION: Rotor S-02 Air Screw Drivers on vault assembly job *paid for themselves in 8.6 weeks.* **RESULT:** Time per unit with former hand screw drivers was 13 seconds. With the 2000 rpm S-02 PRC, it is 4.4 seconds.

Rotor S-02 screw drivers and nut setters are available with three types of drives, with reversible or non-reversible motor, lever or pistol throttle, and with long or short angle head (with six different spindles). At least three speeds for each model. All models are quieter. Ask for a demonstration on your job. Bulletin 46 free on request. The ROTOR TOOL Company, Cleveland 32, Ohio.

Here's the RIGHT TOOL for YOUR job!

Rotor Air Tools: Assembly Tools • Drills • Small Wheel Grinders
Straight Grinders • Vertical Grinders • Scalers • Chippers • Rammers
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WASHINGTON...

Saltonstall Bill outlook . . .

Senator Saltonstall's highly-touted bill to overhaul military procurement policy faces tough sledding. House Armed Services Committee Democrats and other small business proponents will fight the proposal.

The new bill is essentially the same as the procurement reform bill introduced by the Massachusetts Republican last year. It's aimed to allow the Defense Dept greater flexibility in procurement contracting and to step up development of new weapon systems.

The bill provides for (1) increased use of negotiated fixed-price contracts, with special incentives for production cost reductions; (2) wider application of the weapon system management concept, under which prime contractors have increased powers; and (3) other procurement short cuts.

Small business spokesmen are suspicious of the measure's stress on weapon system management, which most of them consider a means to limit defense business for small firms. While supporting the Saltonstall Bill's general intent to streamline and make more flexible procurement practices, the Pentagon has yet to comment officially on the bill's detailed provisions.

The bill would allow the military greater latitude to award negotiated—as opposed to advertised—contracts. Under present law, advertised procurement is considered the general rule. Negotiated procurement is allowed only under specific exemptions to the law, which the Pentagon must justify in great detail before signing contracts. This means lots of red tape and delay.

The proposal, however, flies in the face of growing Congressional demands for a greater volume of advertised procurement—the actual trend favors negotiation over complex new projects rather than advertised bidding. Congressional critics argue that this trend leads to greater concentration of defense business among fewer numbers of contractors.

New ordnance cost controls . . .

Metalworking contractors for Army Ordnance will be put through the wringer under a new Ordnance value analysis program aimed to cut production costs.

Under its provisions, an Ordnance team of engineers and auditors will inspect contractor plants to determine new ways of trimming costs. The inspectors will check, for instance, whether contractors can substitute less costly materials in the performance of the contract, whether in the transition to more advanced missile projects the contractor can use surplus material left over from a preceding weapon project.

Two missile plants have already been inspected by Ordnance's value analysis team. As a result, several engineering change orders have been issued to the contractors. In one case, for example, the inspectors challenged the need for an extremely smooth finish on a missile part. They said the extreme finish specifications—and the added costs involved—"added nothing to the (part's) function." So the specs were changed.

"Buy American" again . . .

Federal purchase of domestic machinery at prices higher than those for foreign-produced equipment is raising a big furor again. The British in particular—the losers in the current situation—are raising a tremendous cry against Eisenhower's policy.

The controversy revolves around the application of the so-called "Buy American Law"—and the latest twist is the decision by Defense Mobilizer Leo A. Hoegh to award a $1.7-million contract for two hydraulic turbines to Baldwin-Lima-Hamilton Co, Eddystone, Penna. The low bidder—19% below Baldwin-Lima-Hamilton—was Britain's English Electric Co.

Basically, U S producers are supposed to get the government order if their bid is no more than 6% higher than the low foreign bid—or 12% if they're from a depressed area. But there's also the provision for handling a U S firm a contract at any price if it's found necessary to defense. **Baldwin-Lima-Hamilton** was found essential to defense because its plant contains some so-called "elephant tools."

While heavy electrical equipment has been most publicly involved, other equipment has also figured in Buy American controversies. Italian, German, and Swiss suppliers of office machinery and equipment—typewriters, adding machines, and the like—have complained the Post Office Department is favoring higher-priced domestic suppliers.

The turbine case is the latest turn in an old battle. General Electric and the National Association of Electrical Manufacturers have pending a request that all heavy electrical equipment be ruled essential to U S defense, and that all imports be drastically curbed or completely banned. A ruling on this is expected in a few weeks.

Another Buy American situation involves state highway department purchases of materials for the huge Interstate Highway Building Program —90% of which is paid for with federal funds.

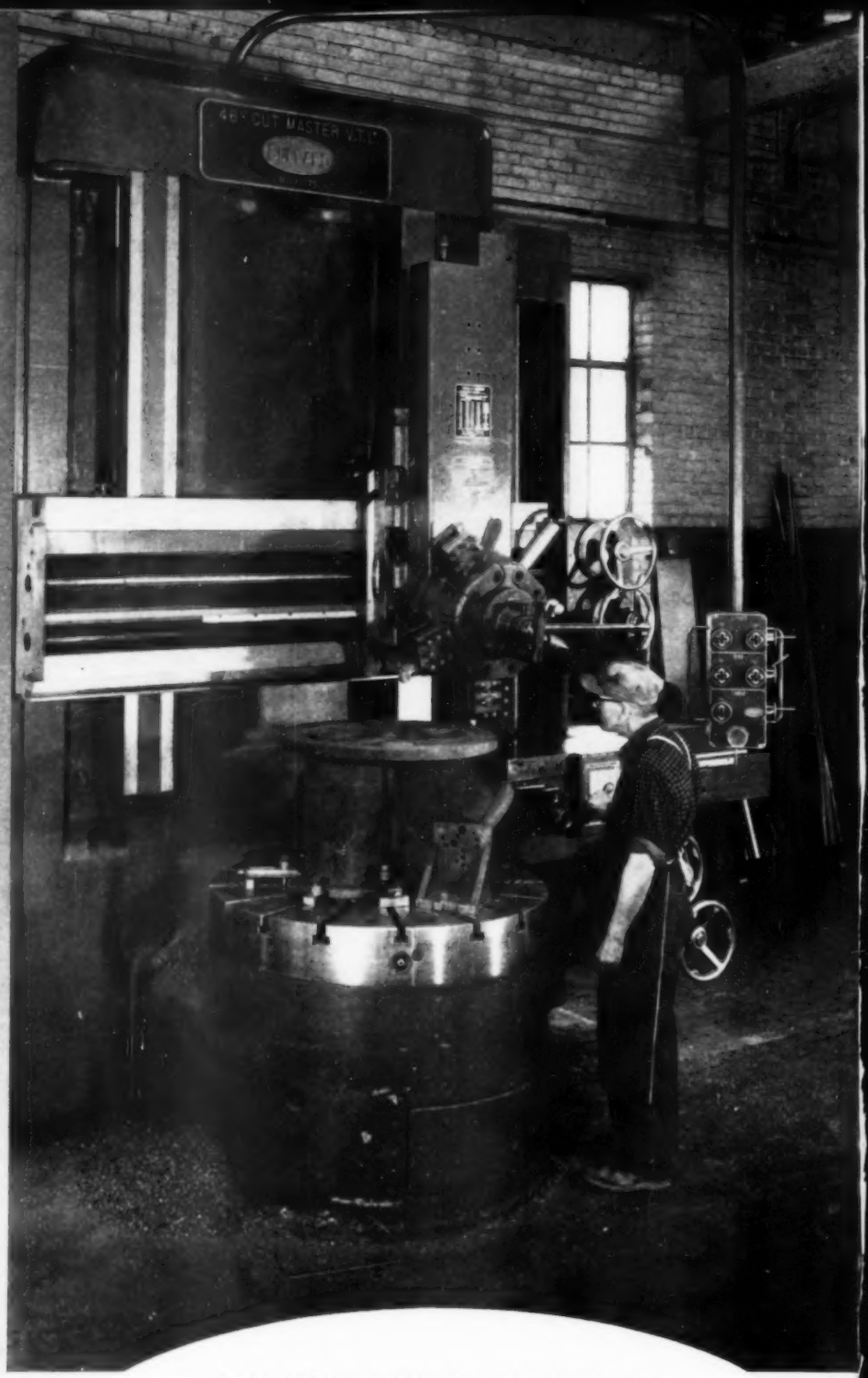
"We are WELL SATISFIED with our

BULLARD

Cut Master V.T.L., Model 75

Extreme accuracy is mandatory for a number of machining jobs at the Fuller Company, Manheim, Pa. For example, according to Mr. M. L. Strayer, Machine Shop Supt. "the largest volume piece we process on our Cut Master, Model 75, is the facing of seats for cement diverting valves. They must be perfectly flat. This critical operation is done so accurately on the Bullard Cut Master, Model 75, that with a little hand lapping we have an airtight joint."

This machine has a 24" extra high bed, speed range 6.8 to 250.0 R.P.M. Equipped with 5 sided Turret Head and 4 sided Side Head, both hand indexing, 4 jaw hand operated chuck.



This "built-in" accuracy, which is inherent in every Bullard Cut Master V.T.L., Model 75, can be applied to your work.

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THE BULLARD COMPANY

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CONNECTICUT

DETROIT...

Production settles down...

Car makers are humming along at a pace that confirms optimistic predictions for a 5.5 to 6-million car year. The few soft spots are more than matched by gains in other areas.

Buick, which seems to have filled its pipeline, laid off 2000 workers on February 2 and cut production back from 8900 to 7500 units weekly. Pontiac and Oldsmobile, on the other hand, plan continuance of their approximate 10,000 unit weekly pace.

Buick historically has usually been GM's second biggest producer, and this year professionals have unanimously voted it GM's best styled car. Also, the make has always enjoyed a high degree of owner loyalty, so the finger can only point to poor dealer performance.

Ford Division, meanwhile, continues to boom. February schedules have just been increased 13% over previous plans, a figure 31% higher than in the same month last year. The division's truck sales are up 25% over 1958. In the shadow of its big cousin, little noticed Edsel produced four times more cars this January than last.

Chrysler and its divisions have been producing cars whenever they could get some glass. Enough was acquired, because of a short-lived Canadian assembly workers strike, to build 4600 Plymouths during the third week of January. Overall, the company may never recoup the volume lost from its own and supplier walkouts this model year, because many potential buyers must by now have purchased an alternate make.

As is getting to be usual, the independents are continuing to post records. Little-watched Willys belatedly announced an all-time high December, pushing its final quarter volume 40% ahead of 1957.

Studebaker posted a healthy $3.7-million operating profit for the quarter, stemming from the whopping 180-plus-per-cent increase in sales since the Lark was introduced. The company has acquired over 500 new dealers during this period, and has moved up to a ten-hour, six-day working week.

But there is a note of warning from dealers in all makes. Their trade paper, *Automotive News*, reports some spread of discounting and other "blitz-type" selling of the kind not usually encountered until late in the year.

Report from space...

Reporters recently were given their first chance to tour Chrysler's tightly guarded Detroit Missile Plant, where Redstone and Jupiter are in "serial" production. Five of the latter were on the line that day.

Defense and Special Products Group VP Thomas F Morrow was obviously proud of the contribution of automotive techniques to missile production, and the fact that the Jupiter, now overseas with a tactical squadron, was three months ahead of schedule.

Auto industry standards of quality control, he said, produce a missile ready for fueling and firing. Visitors saw the elaborate final inspection bays where these weapons (each containing about 300,000 parts) go through a simulated count down and flight.

Actually, 100% inspection is not considered good enough. Many components are inspected between 800 and 1200% as they are built up into more and more complex sub-assemblies.

The pay-off comes in their operational record. Redstone has been fired 38 times since August 29, 1953, and 35 of these flights were considered completely successful by the Defense Dept. Jupiter C, a hopped-up Redstone, has an 8 to 1 record, and Jupiter itself, with 13 firings, is batting about .500.

Chrysler's sub setup...

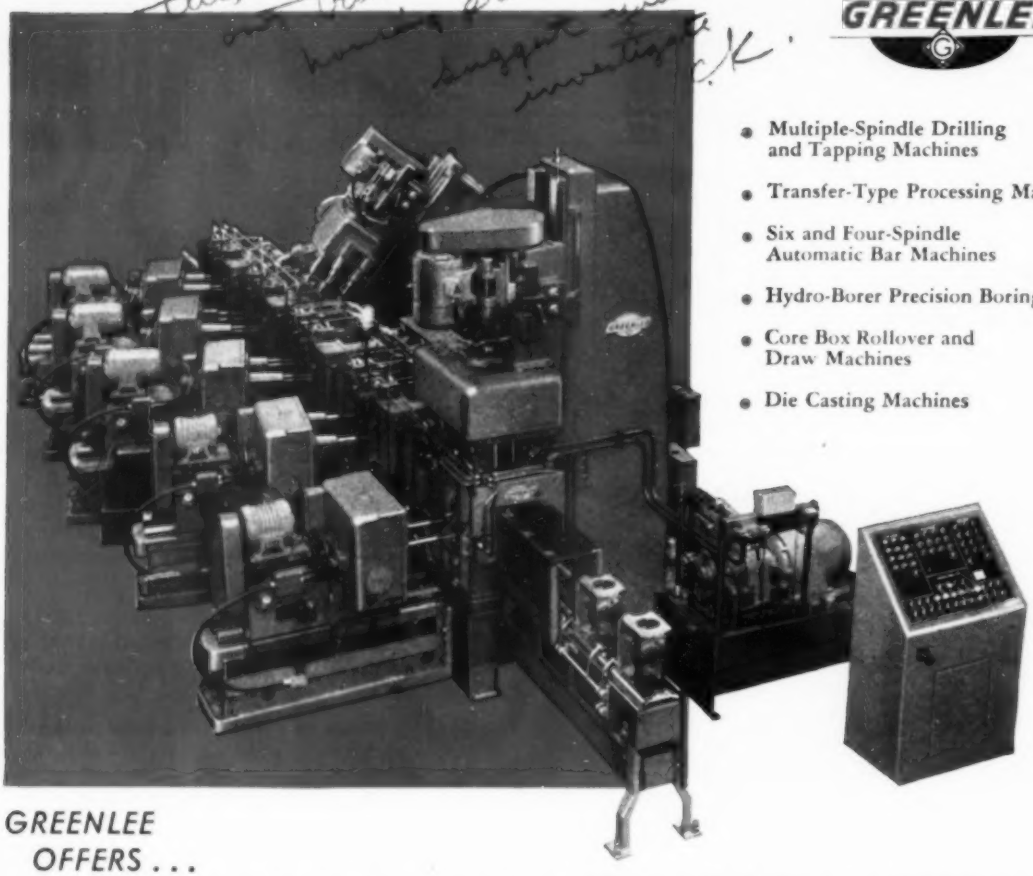
Chrysler uses 2500 subcontractors to supply 51% if its missile parts requirements. It keeps everyone on schedule by an automotive-type block system under which a number of missiles of the same design and similar materials are programmed, with engineering improvements introduced by block. Typical of the latter are several electronic distribution centers employing printed circuits which have reduced the number of soldered joints by 90%.

Morrow is optimistic about Jupiter's future despite recent sniping from other branches of the Armed Forces. But, he noted, contracts are year-to-year affairs as the money is appropriated. The Army's Major General W W Dick backed him by flatly stating that Jupiter would be a useful weapon for 6 to 12 years to come.

Relief for the farmer...

Ford has designed a 12 speed clutchless transmission for its new line of farm tractors. It consists of three planetary gear sets combined with a constant reduction gear, and sells for about $180 extra. Speed choice is selected hydraulically by a lever on the steering gear column.

Sam: this may solve our transmission housing problems. Suggest you investigate. E.K.



GREENLEE

- Multiple-Spindle Drilling and Tapping Machines
- Transfer-Type Processing Machines
- Six and Four-Spindle Automatic Bar Machines
- Hydro-Borer Precision Boring Machines
- Core Box Rollover and Draw Machines
- Die Casting Machines

GREENLEE OFFERS . . .

COOPERATION FOR AUTOMATIC PRODUCTION

The emphasis is on cooperation at Greenlee. Your ideas are added to Greenlee's. One idea sparks another. The result . . . the creation of machines that will meet your requirements efficiently . . . economically . . . now and in the future. Top-flight Greenlee engineers help you avoid costly mistakes. Their thinking is sound . . . respected. Call Greenlee. Let them give you the complete story on cooperation for automatic production.

MACHINES DESIGNED WITH THE FUTURE IN MIND

GREENLEE BROS. & CO.

1746 MASON AVENUE
ROCKFORD, ILLINOIS

Joe: these people have a lot of machines in Detroit look them over and let me have your reaction - Sam

CIRCLE 241 READER SERVICE CARD

AIRCRAFT and MISSILES... TRENDS

AIA goes to bat . . .

With the convening of the 86th Congress, Aircraft Industries Association has taken a four-way stand on matters vital to its member aircraft and missile companies. Here are four major legislative actions slated for this session of Congress, and AIA's views on each:

- **Renegotiation.** This law is scheduled to expire June 30, but hearings on its extension are on the docket. AIA feels that current administration of the Act is wrong in its definition of "excessive profits." The Association points out that the aircraft and missile industry's earning rate is less than half that of comparable manufacturing enterprises—yet Renegotiation Boards persist in ruling a company's earnings as excessive even when they fall into this comparatively low level of profit.

- **Indemnification.** Bill now up before Congress would provide for the indemnification of contractors against unusually hazardous risks arising from the Defense Dept's weapons program. In other words, aircraft and missile makers would get the same financial protection now available to Atomic Energy Commission contractors. AIA favors the new bill on grounds that "There is no insurance available from commercial sources to take care of the several areas of great risk in missile and other weapon programs."

- **Procurement Act amendments.** AIA contends that "any procedure as carefully governed as procurement requires a thorough examination. And it is expected that forthcoming hearings will discover possible flaws and provide a basis for correction of any sections that might work against its broad intention of efficiency."

AIA is referring, of course, to the Air Force's controversial "Make or Buy" rulings (now about to be adopted by other government procurement agencies), designed to keep prime contractors from pulling in ordinarly subcontracted work.

- **Space Act provisions.** The present patent provision in the Act which created the National Aeronautics and Space Administration states that any invention (with minor exceptions) made in the course of work under an NASA contract is the exclusive property of the government. Defense Dept regulations allow a company to retain title to the invention but the government holds license rights. AIA's thinking: "Such wide differences in patent provisions can only hamper contractors in their dealings with Defense Dept agencies."

Where the budget money will go . . .

A comparison between defense spending and appropriation requests in fiscal 1959 and 1960 shows (1) that spending for planes will drop but missile expenditures will rise, (2) that new appropriations for aircraft will stay just about the same, but those for missiles will drop, and (3) R & D money will increase.

The three Services will buy 1610 planes at a cost of $6.8 billion, down from fiscal 1959's 1460 aircraft costing $7.3 billion. Air Force will order several dozen more Boeing B-52 heavy bombers and more Boeing KG-135 jet tankers, plus several dozen more Convair B-58 supersonic medium bombers.

But the Air Force will buy no more interceptors next year, meaning a phase-out or at best a stretchout for Convair's F-106.

Navy will buy more all-weather fighter-interceptors (notably McDonnell's F4H-1), fewer attack planes. Army will boost orders for turboprop observation planes, cut contracts for helicopters.

Missile procurement down . . .

Total new orders for missiles will drop from 1959's $4.1 billion to $3.8 billion in fiscal 1960, but procurement of Air Force ICBMs and the Navy's Polaris missile will rise. Big reduction comes from several project phase-outs.

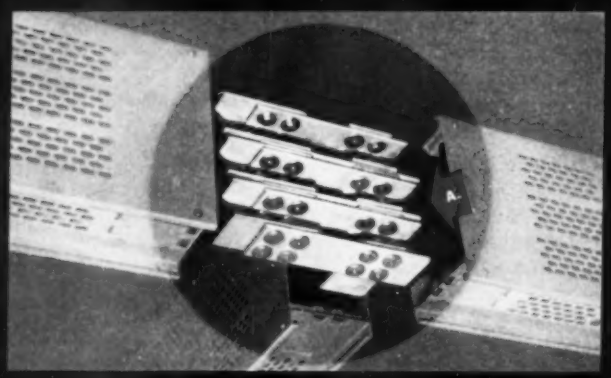
Contracts for Convair's Atlas and Martin's Titan ICBMs will increase, and new contracts will be let for North American's Hound Dog, Martin's Mace, Hughes' Falcon, McDonnell's Quail, and Boeing's Bomarc missiles.

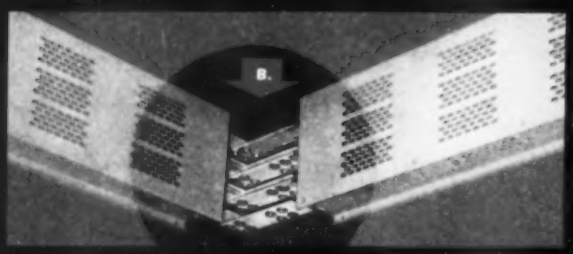
Production of Douglas's Thor and Chrysler's Jupiter IRBMS will end in fiscal 1960, but these missiles may continue to be made as boosters for space probes conducted by ARPA and NASA.

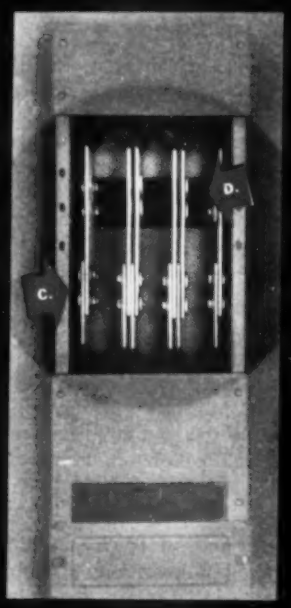
The Navy will place orders for the Sparrow III, Bullpup, Sidewinder, Talos, Tartar and Terrier missiles. The Army will continue production of the Nike Hercules and Hawk, will accelerate its Pershing and Sergeant projects, and will phase out the Redstone in 1960.

Research and development will increase $200 million in fiscal 1960 to $3.7 billion. Of this, $1.4 billion will go for such projects as the Air Force's Minuteman and the Army's Nike Zeus; $487.3 million for such aircraft as the B-70, F-108, and the Dyna-Soar boost-glide bomber; and $309.1 million for military astronautic projects—development of reconnaissance communications and navigation satellites.

Eliminate costly factory-built "tees" and "elbows"







Cut installation and maintenance costs

FEDERAL PACIFIC'S NEW LOW IMPEDANCE BUS DUCT features a unique splicing system which permits "tees" and "elbows" to be built up on the job site using standard bus duct sections—thus eliminating costly factory-built fittings. Result: substantially lower initial cost, no delivery delays, greater flexibility and higher salvage value. Splicing system has fewer joints. Result: faster installation and less maintenance. Available in both Feeder and Plug-in types. For complete, detailed information, write for Bulletin 3-125: Federal Pacific Electric Company, General Offices: Dept. 304, Newark 1, New Jersey.

A. "TEE" MADE FROM THREE STANDARD SECTIONS—can be either forward or rearward. Only two splices instead of three on factory-built units.

B. "ELBOW" MADE FROM TWO STANDARD SECTIONS—can be either forward or rearward. Only one splice instead of two on factory-built units.

C. FEWER JOINTS PER BUS BAR—straight lengths require four instead of six joints. On larger duct only seven joints are required instead of twelve.

D. PROVISION FOR CURRENT TAKE-OFF DEVICES—A spare set of holes is provided at each splice to accommodate future additions of current take-off devices.

FPE

FEDERAL PACIFIC ELECTRIC COMPANY

The Best in Electrical Distribution and Control Equipment

CIRCLE 242 READER SERVICE CARD

MACHINE TOOLS...

Chrysler and GM placing orders . . .

The machine tool order pot in Detroit has started to boil. Chrysler, for one, has begun to place business for its transmission tooling program which is on a "crash" basis.

First purchases are machines for a transmission production line for the new small car. A little later orders will be allocated for a line for other Chrysler cars. And within a year a third transmission line will be ordered. Total outlay for the three production lines is estimated at $30 million. Chrysler is seeking deliveries of the first machines next summer, hoping to get into production well before the end of the year.

Detroit transmission's program for a newly-designed hydromatic transmission production line will run to $50 million, according to best estimates. Initial orders have been placed and purchasing for the entire program probably will stretch over the next 60 days.

Chevrolet has given some business to machine tool builders for six-cylinder engine manufacture. Part of the machines will be for expansion of capacity and some for replacement and cost reduction. Chevrolet apparently underestimated the demand for six-cylinder cars in '59 models.

Two other important automotive tooling programs are being acted upon currently. They involve total outlays of around $25 million for machine tools.

January orders for machine tools are estimated to have equaled the December volume at the worst and probably to have been considerably ahead. December showed a sharp upturn compared with November.

Natco buys honing tool maker . . .

National Automatic Tool Co, Richmond, Ind, has purchased the Jes-Cal Co, Fraser, Mich, maker of honing tools. Natco, which builds multiple-spindle machine tools, expects to develop, manufacture and sell a newly-designed machine utilizing the size control honing tools made by Jes-Cal. The honing tools—used in the auto, farm machinery, aircraft, ordnance and compressor industries—will continue to be produced at Fraser.

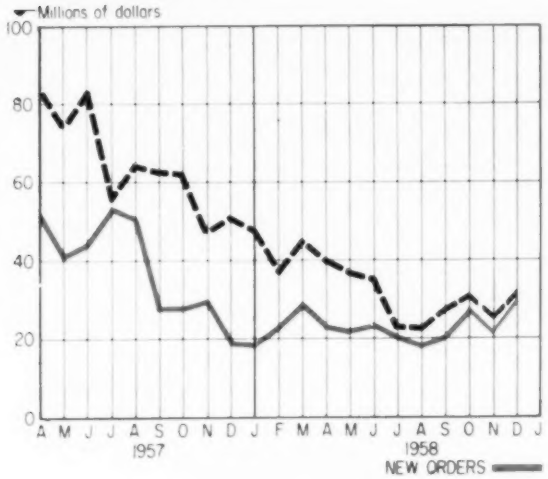
H W Bockhoff and N M Forsythe, Natco chairman and president respectively, will serve in the same capacities with Jes-Cal. C P Smith, formerly chief engineer, will be vice president and general manager. F J Jeschke and G M Calvert, former co-owners of Jes-Cal, have been appointed vice presidents.

Landis Tool host to military . . .

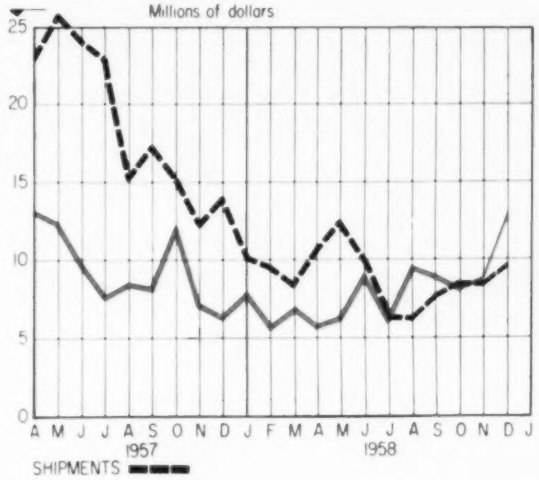
Some 18 members of the Machine Tool Committee of the Industrial College of the Armed Forces visited the Landis Tool Co, Waynesboro, Pa, on January 23. In addition to inspecting the Landis plant, the officers (representing the Army, Navy, Air Force and Marines) heard talks by John Williams, chief Production Equipment Branch, Office of Assistant Secretary of Defense; M A Hollengreen, president Landis Tool Co; and Ralph Price, vice president and assistant general manager Landis Tool Co. The topic: machine tools and national defense.

BF

Metal-cutting machines



Metal-forming machines



NEW LEADED STEELS FROM RYERSON

Now, machine parts faster than ever before

NEW LEDLOY 170 TUBING

average machining speed 170 surface feet per minute

Here's the fastest-machining steel tubing ever produced —and only Ryerson has it available for immediate shipment from stock. Ledloy* 170 is a cold drawn, seamless product of low carbon analysis with .15% to .35% lead added. It promises a minimum increase of 25% in productivity of machined parts or components. Sizes range from 1" to 2½" O.D. with maximum ⅜" wall thickness. Other sizes can be supplied promptly.

Part produced from Ledloy 170 Tubing for machining-comparison at National Metal Show.

NEW LEDLOY 375 BARS

average machining speed 375 surface feet per minute

This newest addition to Ryerson free-machining screw steel stocks is the world's fastest-machining steel. Assigning the figure 100 to B-1112 and using this as a base, Ledloy 375 has a machinability index of 205 plus. It rates about 64% higher than B-1113 and about 20% higher than Ledloy 300.

Ledloy 375 bars presently in Ryerson stocks include rounds in sizes from ¼" to 1", hexagons ¼" to ⅝".

Ask your Ryerson representative for complete details on these new steels. And call Ryerson for an unequaled selection of cold finished bars and tubing, including the largest stocks of Ledloy 300 (also known as Ledloy A) and Ryeut* leaded alloys—the fastest machining in their carbon ranges.

MACHINING COMPARISON*
Ledloy 170 Tubing vs. Nonleaded Tubing

	Ledloy 170		MT-1015	
	Speeds	Feeds	Speeds	Feeds
Center drill	172 s.f.m.	.005"	110 s.f.m.	.005"
Form tool	172 s.f.m.	.0008"	110 s.f.m.	.0008"
Boring tool	172 s.f.m.	.007"	110 s.f.m.	.007"
Cutoff	172 s.f.m.	.0013"	110 s.f.m.	.0013"
Thread	27 s.f.m.	—	20 s.f.m.	—
Tap	18 s.f.m.	—	12 s.f.m.	—
Production time	35 seconds		49 seconds	

* As demonstrated at National Metal Show, Cleveland, 1958.

RYERSON STEEL®

Member of the Steel Family

Principal Products: Carbon, alloy and stainless steel — bars, structurals, plates, sheets, tubing — aluminum, industrial plastics, metalworking machinery, etc.

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • WALLINGFORD, CONN. • PHILADELPHIA • CHARLOTTE • CINCINNATI • CLEVELAND DETROIT • PITTSBURGH • BUFFALO • INDIANAPOLIS • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

MATERIALS... TRENDS

Showing nickel's worth . . .

International Nickel Co, Inc, in an unprecedented campaign, is going directly to the consumer to show the value of nickel-alloyed stainless steel. At least 29 of the country's top department stores are taking part in Inco's "Gleam of Stainless" promotion which started on Feb 2 and will continue until Feb 14.

America's leading producers of stainless steel are supporting the drive and are participating in the promotion. Manufacturers of stainless-steel products are coordinating their own, individual promotions with the all-out effort. As a further step in the program, producers of stainless steel and their customers, the product manufacturers, will be offered a broader and more intensive application engineering service by Inco.

Much more significant than simply selling stainless, this campaign is only part of a major effort to regain friendships strained during the long period of nickel allocation. Stainless-steel producers use 35% of Inco's nickel and some of them are unhappy with the quantities they received while the metal was rationed.

"Now there is enough nickel to meet every anticipated need," says Inco. And the company has switched from apologizing to intensive selling. By broadcasting the virtues of nickel-containing products directly to consumers and fabricators, Inco hopes to improve its good will and compensate for previous enforced curtailment of its product. Fundamentally, this consumer promotion is a sharp reversal of policy for such a highly conservative organization as International Nickel.

Standard engineered springs . . .

It has been apparent for a long time that standard helical springs in the precision mechanical-spring field would have many advantages. However, there have been obstacles to standardizing engineered springs simply because of the difficulty of getting large users of springs to agree on standard sizes that warrant quantity production. While it is true that even small quantities of special springs are not particularly expensive, deliveries are frequently delayed by setup and scheduling requirements.

Development of the "Select-A-Spring" system of engineered standard helical springs, by Wallace Barnes Div of Associated Spring Corp (Bristol, Conn), resulted from careful study and correlation of the sizes and capacities of springs needed to meet various space limitations in common applications. By correlating these needs with standard wire sizes and commonly used drilled-hole sizes, a broad range of specifications were selected to cover a large proportion of needs.

About 500 separate sizes of compression and extension springs are available off-the-shelf by catalog number in the Select-A-Spring system. Meeting industry and military standards, they are available in either music wire or stainless-steel wire, certified to military and aircraft specs.

Shell-molded castings gain . . .

Engineers at General Motors Corp's Central Foundry Div (Saginaw, Mich) believe that it may soon be more economical to produce most small castings by the shell process, according to C D Evans, product development engineer. He pointed out that while the original cost of the casting might be higher than that of a green-sand casting, the cost to the customer frequently is lower because of lower weight, elimination of some machining steps, and the saving in the amount of metal used.

A satisfactory substitute for phenolic resin as the shell binder has been sought by GM for several years. Its discovery, said J H Smith, division general manager, would "immensely improve" the application of this form of casting by cutting unit costs.

Pearlitic castings will be used in substantially larger numbers i the automotive field, said another of GM's product development engineers, J L Flitz. Higher strength characteristics offer lower cost as well as weight savings. The various comments were made at the latest of 12 casting conferences held as an educational program for customers, held at Saginaw by the Central Foundry Div.

Plastic flexibly reinforced . . .

Primarily for large castings, a new line of sisal-phenolic material has been developed by Rogers Corp (Rogers, Conn), which offers medium and medium-high impact strength at low cost. Called RX-825 and RX-831, these new sisal (rope fiber) reinforced materials are basically two-step molding compounds, also available in nodular form, which can be preformed and molded on conventional equipment. RX-831 is recommended for impact applications requiring long flow and fast cure.

For Longer Life . . .
Less Kerf . . . Best Non-Ferrous Cutting

SIMONDS
HARD RIM SAW

This Simonds solid saw (new to the market) has already made a *solid* hit! The men who have to get the work out are sold on the Simonds "Hard Rim's" longer cutting life between sharpenings . . . the better finish it imparts to the non-ferrous metals and plastics it cuts so smoothly . . . the minimum kerf as against non-solid saw cutting. Yes and everyone likes the Simonds "Hard Rim" because of its non-shattering safety when run at high speeds and the protective advantages to personnel.

This very true cutting saw is available in diameters of 8″ to 18″. Try it out — call your Simonds Distributor!

QUICK FACTS

Saw Rim — Made very hard for unparalleled resistance to abrasion and wear

Saw Body — Made just hard enough to keep the saw cutting straight

Resharpening — Easily done on standard saw grinding equipment

For Fast Service from Complete Stocks Call your **SIMONDS Industrial Supply DISTRIBUTOR**

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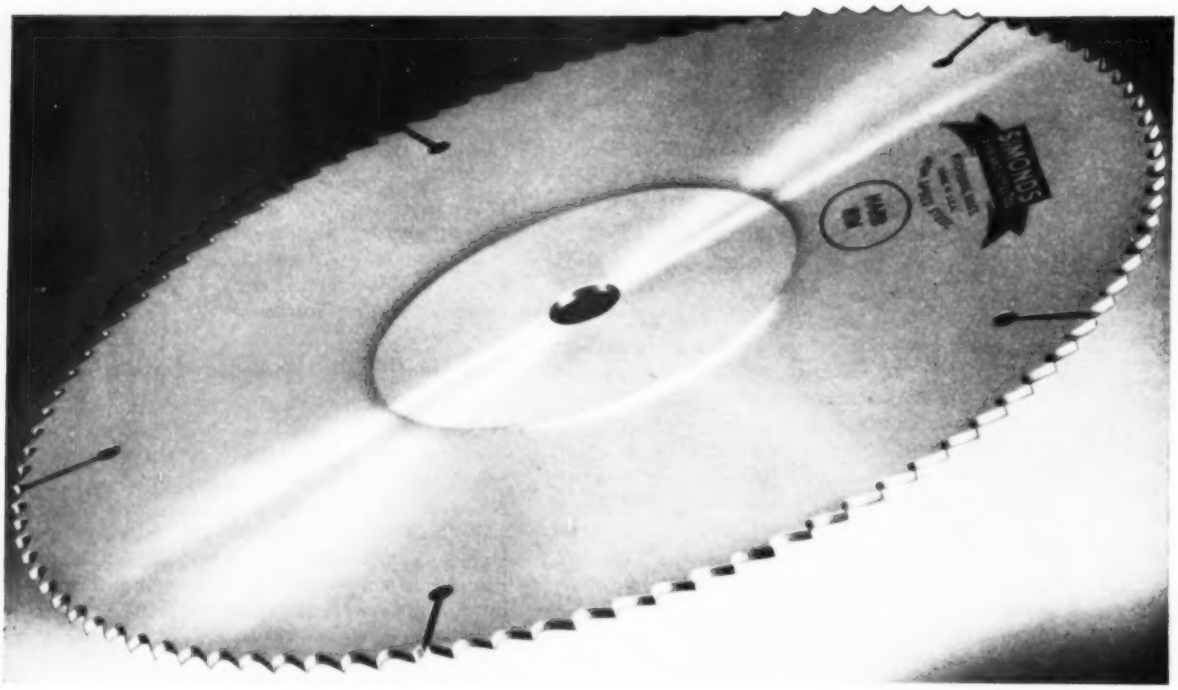
Canadian Factory in Montreal, Que., Simonds Divisions: Simonds Steel Mill, Lockport, N. Y.
Heller Tool Co., Newcomerstown, Ohio, Simonds Abrasive Co., Phila., Pa., and Arvida, Que., Canada



WHAT'S AHEAD... in Metalworking

TRENDS

Metalworking has traveled 60% of the recovery road...

Metalworking production, which started to turn up last May, has recovered three-fifths of the ground lost during the 1958 recession. Each month, output is inching up a little from where it was the previous month. This upward movement is expected to continue through the first half of the year.

For a long time, consumer goods plus defense activities, were the chief support of metalworking operations. Lately capital goods production has begun to revive. As the year goes on, manufacture of industrial and electrical machinery is expected to contribute increasingly to the improvement in metalworking's performance.

Metalworking's two major consumer goods industries—automobiles and appliances—continue to roll along at a healthy rate.

One major appliance maker, for instance, expects first half 1959 sales to be 37.4% over last year's totals. Currently sales are running about even with January-February 1958 levels, but it must be remembered those were the appliance industry's two shining months of the year. The big pickup, though, is expected to come in the spring.

Another appliance maker reports refrigerator sales jumped 7% in January, built-in range sales 18%. And this firm, too, anticipates a big business upswing in the second quarter.

It looks like farm machinery manufacturers are headed for another good year, even though net farm income is expected to drop in 1959.

Last year was a record breaker for most farm machinery makers, yet they expect to do even better this year, basing expectations on comparative first quarter orders.

Auto parts manufacturers are expecting a big pickup in orders very soon. One reason: Ford has authorized its suppliers to "cover themselves for the entire 1959 model year" as a hedge against possible strikes. Other automakers are expected to follow suit.

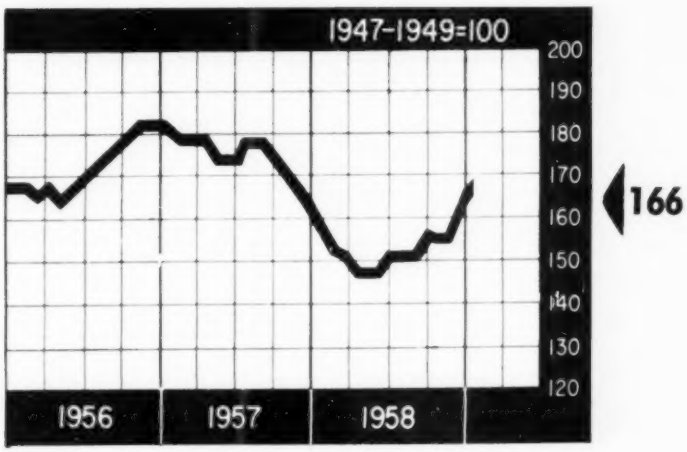
Inventory replenishment against an anticipated steel strike this year is having its effects on steel production, too. Steel output is now running at a solid 75% of 1959 rated capacity—and that equals 79% of 1958 capacity.

Among metalworking's basic industries, screw machine products makers report a sharp upturn in orders and shipments after a slow steady climb since last July's low. The industry closed out 1958 at a production level 17% ahead of the average for the year—and so far this year output is running 10-15% ahead of December.

Heat-treating job shops in their own words now have "business coming out our ears." At least one major heat-treating firm is operating six full days a week, is adding to its workforce almost daily. Heat treating of gears is particularly active, mostly because of increased orders from press manufacturers, and for replacement parts of farm and road machinery.

But general metalworking job shops continue to paint a rather bleak picture of current business conditions. Several such shops have had to let workers go gradually as jobbing fails to keep pace with all-industry recovery.

Backlogs have dwindled to almost nothing and industry officials don't foresee much in the way of a pickup before at least second quarter 1959. Even then, they think, the upswing won't amount to more than 10% at the very outside.



AMERICAN MACHINIST INDEX OF METALWORKING PRODUCTION

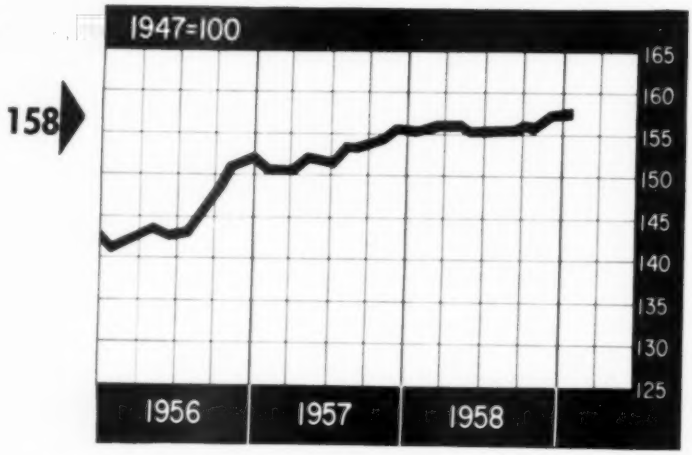
BASED ON MANHOURS WORKED IN THE FIVE COMPONENTS

	JAN Estimated	DEC Preliminary	NOV Revised	DEC Year Ago
Total Index	**166**	**165**	**164**	**163**
Machinery	133	133	136	
Electrical Machinery	189	182	189	
Autos	141	145	136	
Other Transportation	311	310	312	
Other Metalworking	144	143	141	

TRENDS WHAT'S AHEAD... in Business

AMERICAN MACHINIST INDEX OF METALWORKING PRICES

	JAN Estimated	DEC Preliminary	NOV Revised	DEC Year Ago
Total Index	**158.0**	**157.8**	**157.5**	**156.2**
Metalworking Machinery	182.1	181.6	183.0	
Other Machinery exc. Electrical	168.5	167.8	166.4	
Electrical Machinery	158.6	158.6	157.1	
Fabricated Metal Products	148.5	148.3	146.8	



Economy is now back to pre-recession levels...

After whirling through the 1958 recession in rapid style, the economy is about back to where we started, in terms of industrial production, gross national product or a number of other general economic indicators. **The talk going the** rounds today is about "tight money." And to round out the picture of things-just-as-they-used-to-be, the main worry of forecasters is whether the upswing will lead to more inflation, as it did in 1955-1957.

This clearly is what is worrying the President, who stated in his annual economic report to the Congress that: "Self-discipline and restraint are essential if reasonable stability of prices is to be reached within the framework of the free competitive institutions on which we rely. . ."

If the desired results cannot be achieved under our arrangements for determining wages and prices, the alternatives are either inflation . . . or controls.

Perhaps three or four years ago the present concern about inflation would have been more appropriate. At that time business activity was bursting the seams of an economy short on plant capacity, manpower and raw materials—such as steel and copper. There was much less recognition of inflation as a national problem, and little public support for measures to control it. Today it seems that there is more public concern about inflation and less real danger.

The latest figures on our economy hardly indicate a picture of inflationary peril for the months ahead. Here are a few figures from the Latest Economic Report:

- Unemployment is still 6% of the labor force.
- Industry is operating at only 80% of capacity.
- Consumer credit has scarcely expanded in the past six months.
- The nation has impressive reserves of plant, manpower and materials for producing goods.
- It will take some weird changes in the basic laws of economics to bring about rapid inflation in '59.

WEEKLY BUSINESS INDICATORS

	Latest Week	Preceding Week	Year Ago
Business Week Index of Activity (1947-1949=100)*	145.3	145.5	129.6
Steel ingot operation (thousands of tons)	2,212	2,056	1,459
Electric power output (million Kilowatt hours)	13,394	13,324	12,399
Production of automobiles and trucks	159,580	166,694	131,945
Engineering construction awards (Eng. News-Record—millions)	$418.2	$388.1	$389.7

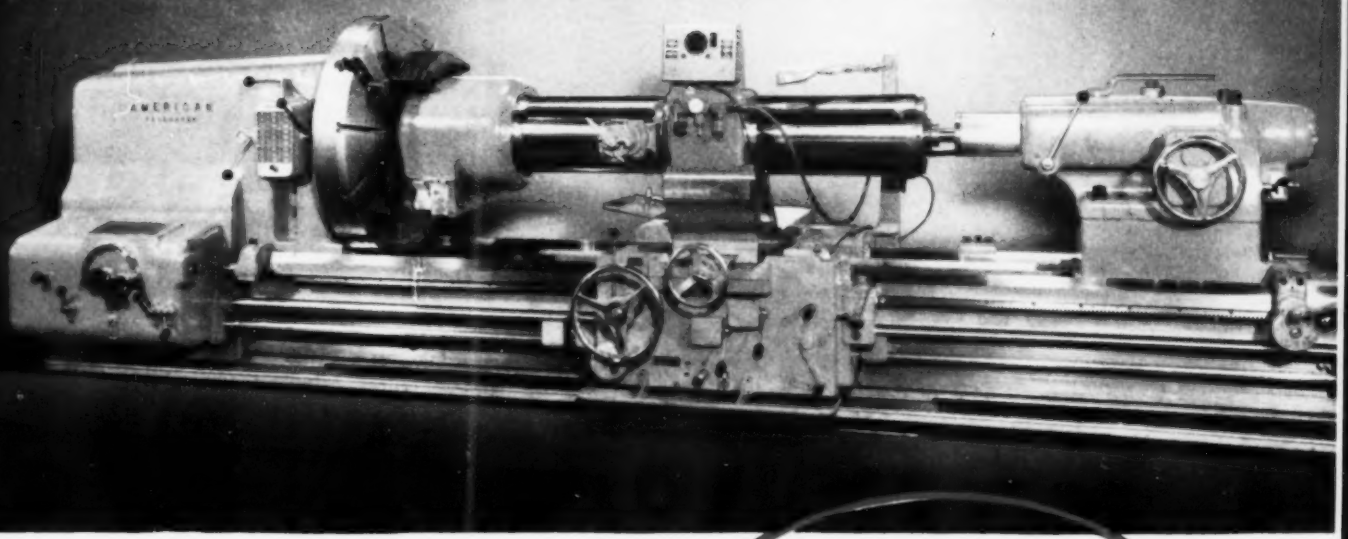
MONTHLY BUSINESS INDICATORS

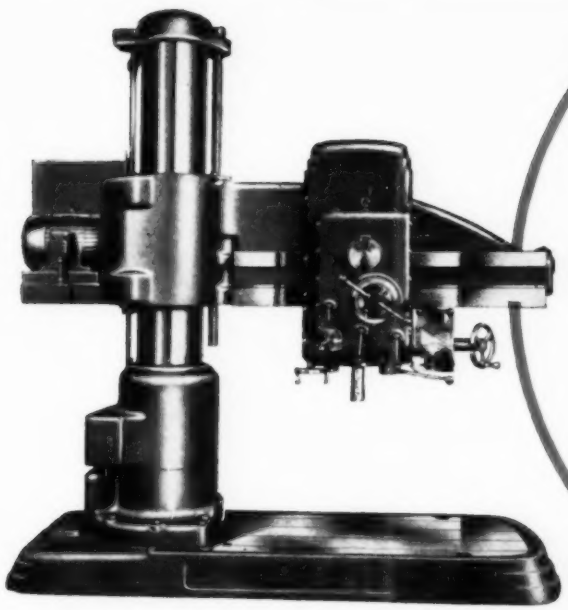
	Latest Month	Preceding Month	Year Ago
Index of industrial production (1947-1949=100)*	142	141	135
Index of durable manufactures production (1947-1949=100)*	152	152	146
Durable goods manufacturers' sales, millions*	$13,393	$12,943	$13,548
Machinery manufacturers' sales, millions*	$ 3,978	$ 3,993	$ 4,175
Durable goods manufacturers' new orders, millions	$13,654	$13,530	$12,362
Machinery manufacturers' new orders, millions	$ 4,128	$ 3,975	$ 3,652
New Orders for Nonelectrical Machinery (1950=100)*	137.9	142.7	122.0
New Contracts for Industrial Construction (1950=100)*	80	72	80

* Seasonally adjusted

MIRROR FINISH

. . . that Reflects not only LIGHT . . . but QUALITY





All "AMERICAN" Hole Wizard Radial Drill Column Sleeves are now super-finished to a beautiful "mirror" finish.

Not only does this vastly improve the appearance of the machine but which is far more important it minimizes the danger of column cutting and scratching.

This operation is done in our own plant on a brand new 40" "AMERICAN" Pacemaker Lathe equipped with a new No. 4 Gisholt Super-finishing attachment.

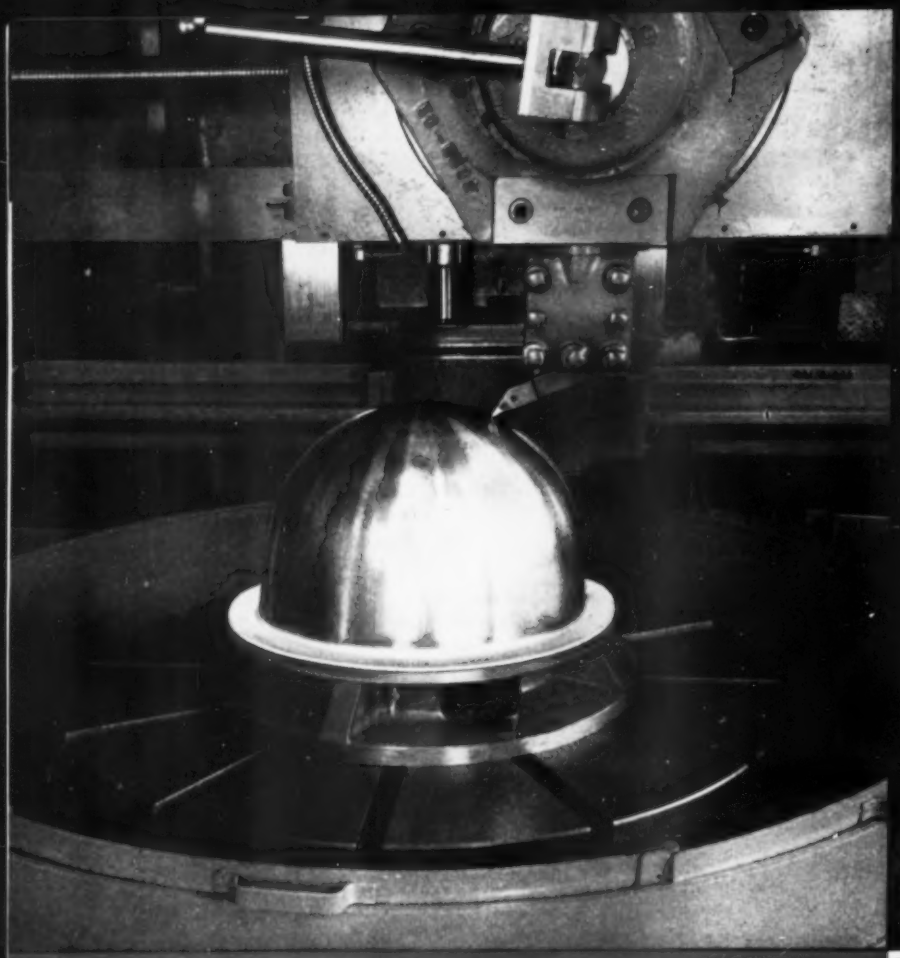
This represents just another step along the path of continuous modernization to improve the quality and also the inherent value of "AMERICAN" Lathes and Radial Drills.

Descriptive bulletin No. 328 will be of interest to you. It illustrates and describes many new and exclusive features.

THE AMERICAN TOOL WORKS CO. Cincinnati 2, Ohio, U. S. A.

LATHES AND RADIAL DRILLS

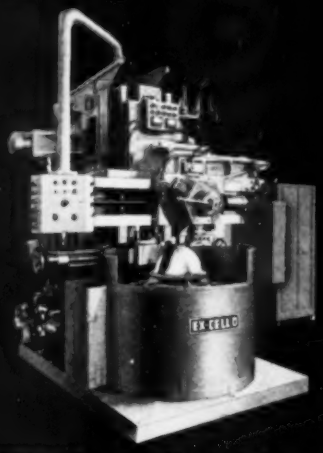
CIRCLE 245 READER SERVICE CARD



XLO

EX-CELL-O FOR PRECISION

LEFT: Single tracer-controlled tool contours aluminum forging to .080" wall thickness holding .001" tolerance inside and outside.



ABOVE: Compact Vertical Contouring Machine handles medium or large workpieces. Slim cabinet at right side holds electronic tracer controls.

Critical Contour Tolerances?

HOLDS WITHIN .001" OF TRUE CONTOUR—INSIDE AND OUT

Close-up shows Style 416 contouring the inside surface. Workpiece is held in a vacuum fixture mounted on the machine table.

58-7

Contouring within .001" of true contour—inside and out—*without waste* requires the kind of precision built into an Ex-Cell-O Style 416 Vertical Contouring Machine.

The aluminum forging illustrated was first contoured on its periphery with a single electronic-tracer-controlled tool, then precision-finished inside to .080" wall thickness.

Designed for contouring hemispherical or irregularly-shaped surfaces, Ex-Cell-O Style 416 Machines also face, bore, turn, groove and chamfer with automatic cycling between loading and unloading.

Call your local Ex-Cell-O Representative, or write directly to Ex-Cell-O for information on other Precision Vertical Boring Machines.

EX-CELL-O CORPORATION
DETROIT 32, MICHIGAN
Machinery Division

MANUFACTURERS OF PRECISION MACHINE TOOLS • GRINDING AND BORING SPINDLES CUTTING TOOLS • TORQUE ACTUATORS • RAILROAD PINS AND BUSHINGS • DRILL JIG BUSHINGS • AIRCRAFT AND MISCELLANEOUS PRODUCTION PARTS • DAIRY EQUIPMENT

American Machinist
MAGAZINE OF METALWORKING PRODUCTION • ESTABLISHED 1877

Much Depends on How It's Handled

The New York Times has made a survey showing that even with the greatly accelerated production pace in the automobile industry, about one out of eight factory workers in the Detroit area still are unemployed.

Similar experiences are reported by The Times from other industrial centers. And the inference is plain that this situation is not temporary but chronic. Fewer people can produce more goods.

The blame is put...

on automation. With rapid mechanization of manufacturing processes, and the growing substitution of mechanical power for muscle power, the ability of the individual worker to increase his output keeps mounting. And the end is not in sight.

Fortunately the permanent displacement of men from certain jobs because the machine has made those jobs unnecessary is not precipitating a resentful outburst against the machine as such. And even at the bottom of the 1958 recession no such resentment appeared, as it did in the dark days of the 1930's.

This change in attitude is not a happenstance. Union leaders and the public, as well as management, have a much clearer understanding of what the machine does for them. Walter Reuther has gone on public record in acknowledgment of the wide benefits of technological advances. So have other union heads.

For the fact is...

that the men in the shop would not go back if they could to the days of lifting and tugging parts all day as they did before automation got going. And their wives love the household appliances because the machine makes possible high real wages for their husbands.

Without automation higher hourly rates would not be possible. Unions long ago have forced industry into a rigid pattern of annual wage increases. Every time a wage hike is granted, management is stimulated to mechanize further so that it is able to pay the new scale. This process is likely to go on and on, without end.

The result will be a continuing decline in the ratio of workers in manufacturing industries to total workers in the nation. The service industries—shopping centers, all kinds of retail stores, service stations, recreation and vacation centers —will need still more people. And government agencies too will be an ever-growing colossus.

Through the years ahead, on the premise that the nation's economy will continue to expand as the population increases, automation should not create a permanent unemployment problem. But admittedly workers will have to shift from one particular job to another because of a certain unavoidable amount of temporary displacement.

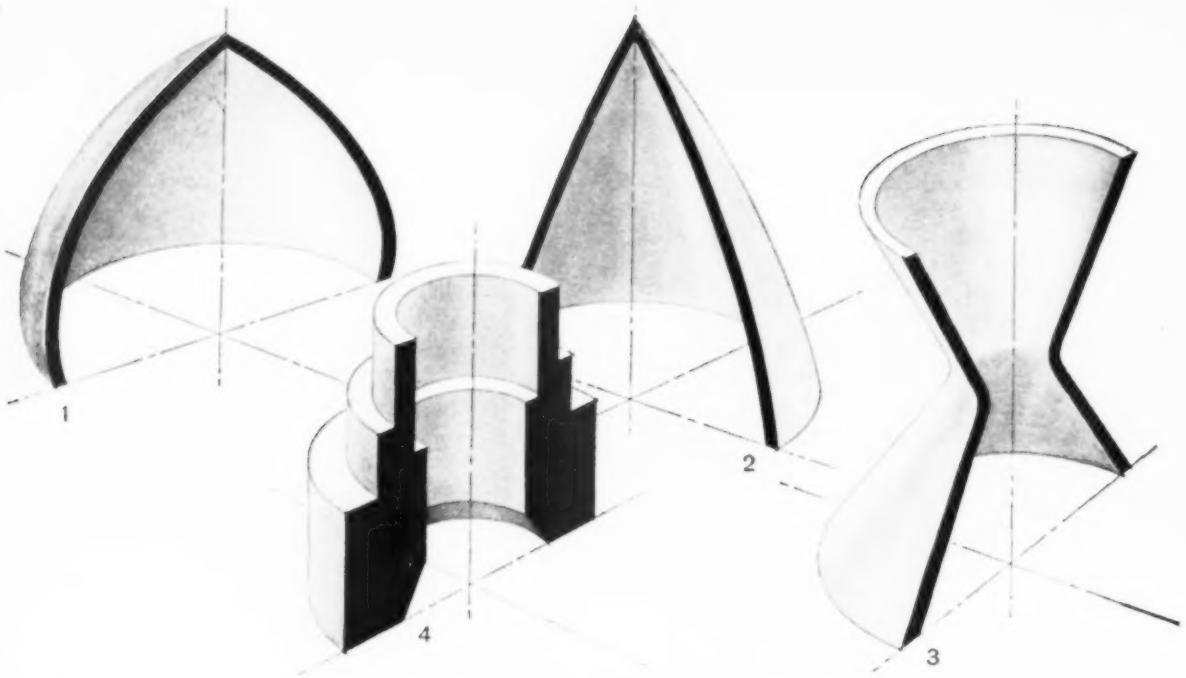
Industry has a vital interest...

in helping to solve the problem of temporary displacement with the least possible dislocation and readjustment in the lives of individual employees. Interest in this problem should be generated at the level of the individual plant affected.

The management of the individual company should tackle the problem with sympathy and understanding. It should plan further mechanization sufficiently ahead that workers are not faced suddenly and almost overnight by the loss of their jobs. It should try to transfer men to other work and retrain them. If it cannot absorb them within the organization, it should exert extraordinary efforts to place them elsewhere.

Automation obviously is here to stay. There is no important opposition to it even in labor circles. Users of automation must get the full benefits of it for everyone concerned by handling the displacement problem in an enlightened and intelligent manner.

Burnham Finney EDITOR



how to Vertical Grind missile shapes

Complex missile shapes such as these, weighing hundreds or thousands of pounds, can be ground accurately on a Springfield vertical contour grinder. These machines are equally at home grinding ceramics, plastics, metals or combinations of materials. Domes (1) of any shape or Cones (2) demanding extreme concentricity can be contour ground on a Springfield. Ceramic coated parts (3) or complex orifices (4) are naturals for grinding on a standard Springfield vertical.

If your missile shapes, *no matter what size*, require contour grinding or have taper holes, irregular holes, offsets, undercuts or angles—we'd like to show you how the Springfield principle of vertical grinding can work for you. Mail the coupon today, for your free and informative copy of "Vertical Universal Grinders"; Bulletin 197-E.

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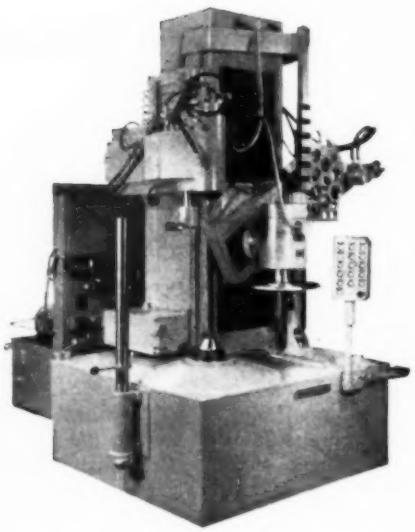
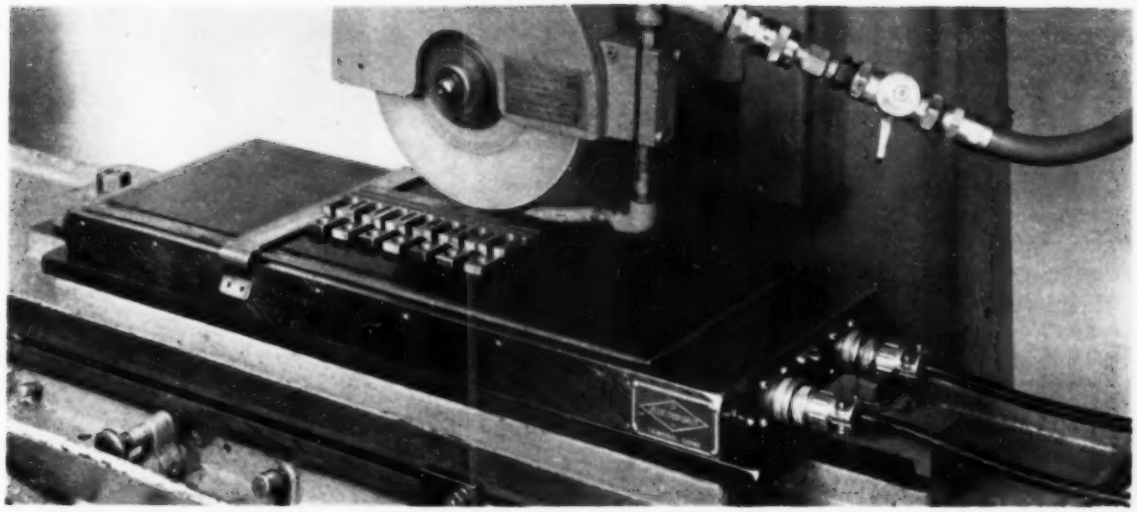


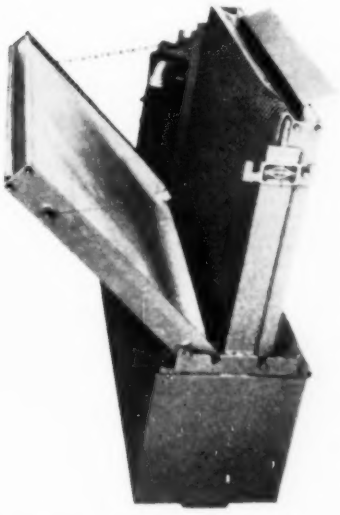
This machine accurately grinds a compound-curve dome. Both the grinding wheel and a single point tool follow a precision template. Automatic parting tools remove excess stock, top and bottom.



Grinding non-magnetic work . . .
is simplified by an electrostatic chuck that holds all electrically conductive materials, ferrous and nonferrous. Illustration shows small stainless steel parts being ground on a 6 x 18-in. reciprocating surface grinder. Flow of dielectric coolant has been shut off to show chuck detail

Electrostatic chuck holds non-magnetic work

Grinding small, non-magnetic work has always been a problem. You either used clamps, designed some special fixture, or maybe even used a vacuum chuck. But clamps and fixtures cost money and can score or distort the part; and vacuum chucks are not particularly suited to small parts. Now, through a new application of an old, well-known principle, you can chuck any electrically conductive material, ferrous or nonferrous, thick or thin—and with one extra step, you can even chuck ceramics or plastics.



High-efficiency filter . . .
provides filtration to 5 microns. Flow can be diverted to either side of unit so that paper filter bags can be changed without stopping the pump

Complicated? Mysterious? Not at all. Unlike magnetic chuck operation, where magnetic flux permeates the ferrous workpiece, the Electroforce chuck develops its holding power through static electric charges on the chuck surface and the parts.

Because the electrostatic holding force is strictly a surface action, this new chuck opens up many possibilities in the design and production of precision parts. The chuck will firmly and positively hold:

- Any nonferrous, electrically conductive material—titanium, aluminum, magnesium, brass, copper, bronze, etc.
- Any ferro-magnetic material—but since no magnetic forces are involved there can be no residual magnetism due to chucking.
- Thick or thin pieces—the holding power does not decrease with thin sections as in the case of a magnetic chuck.
- Non-metallics — ceramics, plastics, and similar materials can be chucked if the chucking surfaces are flashed with a thin metallic coating.

In the actual handling of the workpieces, operation is substantially the same as for a magnetic chuck. Both the parts and the chuck should be thoroughly cleaned before chucking. A dielectric fluid applied to the chuck surfaces excludes air from between the parts and the chuck. The parts are then positioned on the chuck and, at a simple flip of a switch, they are locked in place.

A 110-volt, electronic power supply imposes static electrical charges of opposite polarity on the surfaces of the workpieces and on the chuck. The pieces are held down securely yet can be released instantly for rapid removal.

The chuck circuit is as simple as that of a lamp and battery; a complete circuit includes the chuck, the work, and the power pack. Electric charges are supplied by the power pack; the return circuit is through the chuck housing. The work, therefore, must be connected to the chuck housing. Large, single parts can touch the side or end stops. Smaller pieces should be arranged so they touch each other, with some of them touching the stops. Back-up strips can be used for very small pieces.

Holding power

The primary requirements for maximum holding power are cleanliness and dryness. A freshly machined, improperly cleaned piece

will contaminate the chuck and lessen the gripping power. Moisture, in any form, will also decrease the power of the chuck. Clearly then, a water-base coolant is not practical. Instead, a dielectric coolant composed of a very fluid, highly refined mineral oil is used. Because the coolant must be kept immaculately clean, a compact gravity filtration unit is supplied with the chuck. Filtration is on the order of 5 microns.

Parts must be dry

Moisture can be introduced as condensation on the parts. This can be eliminated by heating the parts a few degrees above room temperature in an electrically heated box, called the Dri-Box, that is supplied as a unit of this chucking system.

Workpiece material can also affect the holding power. Some cast irons for example, are difficult to chuck because the force of the chuck is so great that the carbon granules are pulled from the surface, contaminating the chuck and reducing the holding power. Alternate chucking and unchucking of such a part, wiping the chuck clean each time, is the best way to lick this problem. This applies not only to workpieces but also to any cast iron fixtures, vises, angle plates, etc, that you might want to use with the chuck.

The Electroforce chuck, designed and developed by Electroforce, Inc, Fairfield, Conn, is the heart of this workholding system. Other components of the system include the power pack, the filtration unit, the Dri-Box and, to eliminate that well-known static-charge "tickle," a conductive floor mat on which the operator should stand.

Under development, at present, are two additional workholding devices based on this electrostatic principle —a rotary table and a sine plate. The future? Unlimited.

Straightening presses jump production of adding machine parts 200%

Air-operated mechanical straightening presses have replaced hand-straightening of long, intricate accounting machine parts at Burroughs Corp's Plymouth, Mich, plant **—and they have upped production rates by at least 200%.**

Holds Close Tolerances

Parts for business machines designed to turn out column after column of mathematical totals must be made to extremely close tolerances to insure consistent accuracy in the finished product. Most parts are small, almost miniature, and all are required to function with a minimum of repair and/or adjustment.

Thus an estimated 80% of Burroughs' adding machine parts production must undergo some type of straightening, and according to Burroughs straightening analyst Ray Erickson, almost 25% of the plant's labor force was engaged in this work. Typical of parts involved: center bars and carriage rails.

Replaces Hand Straightening

Material is AISI 8112 tool steel, with size varying from 3/16 by $\frac{5}{8}$ by 5 in. to $\frac{3}{4}$ by $\frac{7}{8}$ by 26 in. Bars must be straightened after contour milling, and accuracy requirements are such that, even after straightening, they are finish ground because the carriage rides on them after the machine is assembled. Until recently, straightening was done by hand —no small job, because considerable operator skill is needed. It is estimated that even the most apt operator needs at least six weeks' training before he becomes fully competent. Moreover, hand straightening depends upon the cut-and-try method. Skilled men often find it necessary to fit and gage, tap and regage several times before the bars pass inspection. Heat treatment also introduces straightening problems with various heats of steel.

Production rates were unavoidably low, depending upon the amount of straightening and gaging necessary. Tool upkeep, although minor, had to be considered, plus the fact that some operators were more skilled than others, no matter how thorough their training. All of these variables were reflected in production rates and quality, so manual straightening was considered, at best, unsatisfactory.

To solve these problems, air-operated mechanical straightening presses (General Manufacturing Co, Detroit) were installed and applied to the job with holding jigs to fit the carriage bars. Training time for operating the presses is only one week or less, and the presses have freed skilled straighteners for other jobs that cannot be handled by machine.

Less Operator Fatigue

Operators find the job less fatiguing, easier, and faster; quality is generally much higher and more consistent, and production has increased. Even figuring the best possible day under the hand-straightening system, production rates have jumped over 200%.

Long parts are straightened progressively as they are fed through a holding jig in this air-operated mechanical press. Straightening head on ram is mounted in universal ball joint, so as to contact the part flat and square. Deflection is shown on dial indicator

The changing US weapon mix

(MILLIONS OF DOLLARS)

	'51	'53	'55	'57	'58	'59*	'60*
AIRCRAFT	2412	7417	8037	7978	8448	7117	6589

	'51	'53	'55	'57	'58	'59*	'60*
MISSILES	21	295	718	2095	2737	3360	3922

*ESTIMATED

Sharp cutbacks ahead for military hard goods

The perennial debate over the state of U.S. military preparedness has moved into the Washington limelight once more with the Senate's new full-scale investigation of the missile, space, and other key defense programs.

The investigation is being conducted jointly by the Senate Armed Services Preparedness Subcommittee and the Senate Aeronautical and Space Sciences Committee under the chairmanship of Senate Majority Leader Lyndon B. Johnson, who heads both groups.

For the administration, the latest defense investigation will furnish an open forum at which to defend itself against serious charges that (1) Russia is outstripping the U.S. in missile production and space exploration, and that (2) the new defense budget sent to Congress last month is inadequate to overcome the Russian lead.

The Pentagon's new budget provides for an increase of $600 million in arms production and development to a total of $17.2 billion in fiscal 1960. Critics in both the Pentagon and Congress complain that the rise isn't even sufficient to absorb normal inflationary cost hikes.

In effect, the critics argue, the new spending plans will mean wide-ranging cuts in overall military hard goods shipments, that holding to the new budget estimates will involve postponement or cancellation of production for several projects.

Looking at the fiscal 1960 budget from another angle—the volume of new contract awards for defense hardware—an even sharper cutback in Pentagon plans becomes apparent. New orders for arms procurement and research and development will drop $600 million from the current level to a total of $18.6 billion.

Here's a breakdown of the major items on the Pentagon's shopping list for next year:

- **A complete breakdown of how fiscal 1960 aircraft and missile money will be spent will be found in "Aircraft and Missiles," p79.**
- **Shipbuilding**—Navy contracts will total $1.9 billion, down $100 million from this year. Plans call for construction of 18 major ships—including another conventionally-powered super aircraft carrier and three more atomic-powered Polaris subs. This will make a total of nine Polaris subs under construction. Contracts will also be let for nuclear reactors and other long-lead time components for three additional Polaris submarines.
- **Electronics**—Over $4.5 billion will be let for missile and aircraft electronics, radar, communications, and other gear. This is roughly the same level as this year, but deliveries are slated to rise sharply. The Air Force alone will order $870.4 million worth of contracts just for ground communications and electronics.
- **Plant and equipment**—Spending is dropping, but the Pentagon still seeks $265 million in new funds for production facilities for advanced weapons.
- **Tanks and trucks**—Tank procurement will rise slightly as the Army modernizes combat units. Truck buying will be trimmed after this year's heavy amount of procurement.
- **Artillery, weapons, and ammunition**—Buying will be increased slightly. The Defense Dept is asking Congress for $358 million in new funds, $20 million more than last year.

Where the military hardware dollar goes

(millions of dollars)

	Expenditures (Shipments)		New appropriation requests	
	Fiscal 1959	Fiscal 1960	Fiscal 1959	Fiscal 1960
Aircraft	$7117	$6589	$6346	$6353
Missiles	3360	3922	4345	3961
Ships, harbor craft	1418	1643	1977	1343
Combat vehicles	148	161	107	111
Support vehicles	78	107	245	172
Weapons	28	28	51	46
Ammunition	335	262	274	290
Electronics, communications	735	1057	1241	1451
Production equipment & facilities	351	272	291	265
Other procurement & production	656	541	436	384
TOTAL MAJOR PROCUREMENT	14,234	14,596	15,325	14,398

Tank cones for the Titan . . .
. . . are built up from conical segments of 2014 aluminum panels. Stretch-formed and trimmed panels are joined by automatic a-c balanced-wave heliarc welding (four skins to a cone)

By F J Schu,
supervisor
Manufacturing Research and Development
The Martin Co
Denver

TOOLING for the TITAN

Rugged, rigid, sensitive—those three words characterize tooling for any ballistic missile. Because they are one-shot weapons, such missiles must function perfectly or they are worse than useless. For this reason, reliability requirements affect every item that goes into a missile, from the smallest bolt to the most complex guidance system, and extremely close tolerances must be held throughout every ballistic missile manufacturing operation.

Tooling developed for producing the Air Force's Titan at Martin-Denver, while similar in many ways to that used in welded-sheet-metal construction of manned aircraft, is actually highly specialized and tailor-made to Titan requirements. Into this category falls most forming, cleaning, plating, heat treating and welding equipment.

Stretch-Wrap Forming

For example, Titan propellant tank domes are made up of elliptical and conical aluminum segments formed on a slightly modified Hufford A-46 stretch-wrap forming machine—faster, cheaper and more uniformly than by press brake and rollforming methods. Too, much reworking has been eliminated.

Previous lack of conformity and development of stresses in the vertex area of the large (82 by 108 in.) sheets has been overcome by adding a 12-in. extension to the die box assembly of the machine. Clearance problems have largely been solved by tailoring the sheet stock to the job. This involves nothing more than shearing triangles from the corners of a sheet.

Two-Way Stretch

Some of the widest extrusions in this country are stretch-formed into tank panels on a two-way Hufford stretch press, which grips the skin on all four sides in the horizontal plane—as a contoured die rises vertically into the work to do the forming. This die exerts a transverse forming force of up to 1400 tons by means of two hydraulic cylinders that provide vertical die table travel up to 2 ft (*AM*—Jul 1 '57, p106).

A longitudinal pull of about 380 tons is achieved by four hydraulic cylinders, two at each end of the press table. These units have a horizontal travel of 106 in., separately controlled, so that distances between jaws are 91 in. minimum and 303 in. maximum. Adjustments may be made through any radius or contour, from a minimum 30-in. radius to a straight line, with 11-segmented end jaws.

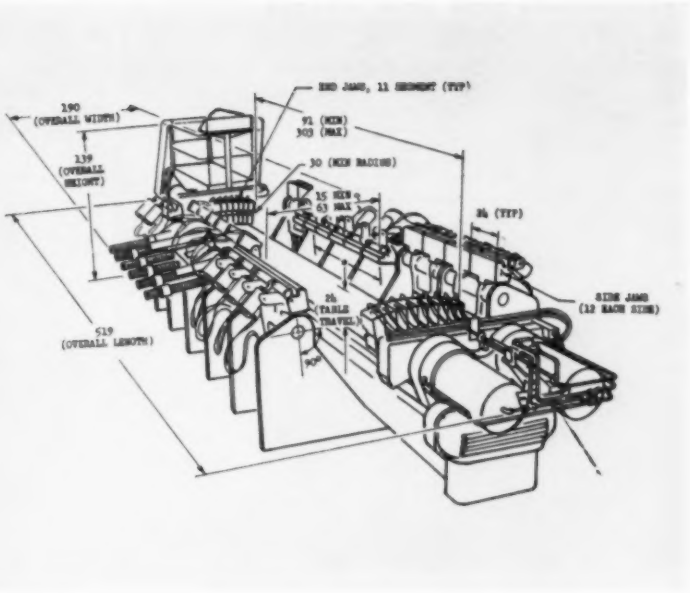
The machine's 12-ft-long side jaws are arranged in banks of 12 on either side, so as to grip stock up to 24 ft long. The jaws can be rotated 90° from horizontal to vertical. Two hydraulic cylinders on each side allow the jaws a 2-ft movement, so that stock width can be controlled from 15 in. to more than 5 ft. Within each bank of 12 jaws is a center group of four jaws that operates as an independent unit. Adjacent four-jaw banks are either connected or free, and each bank has its own actuating cylinder for clamping stock.

Tooling for a variety of shapes is relatively simple because all clamping surfaces are drilled and tapped for attachment of inserts.

Tape-Controlled Milling

Numerically controlled machining of complex sections of large extruded aluminum panels, one of the newest production developments at Martin-Denver, is done with a tape-controlled Giddings & Lewis Numericord milling machine. Two panels can be machined simultaneously, accurately and without templets, because the miller has two heads that can be run in any combination. Table is 8 x 30 ft.

In programming a job, a high-speed IBM 704 digital computer defines the cutter path by calculating auxiliary commands, slowdowns,



Wide aluminum extrusions are stretch-formed . . .
in this 1400-ton two-way Hufford stretch press, which handles material up to 24 ft long. Control console (attached to and mounted over the table bed) moves vertically with the table, giving operator complete control over all operations

stops, time commands and point-to-point loci. The machine tool's program is copied directly from such data onto punched paper tape, then translated to magnetic tape. This method allows one "director" to prepare tapes for many machines.

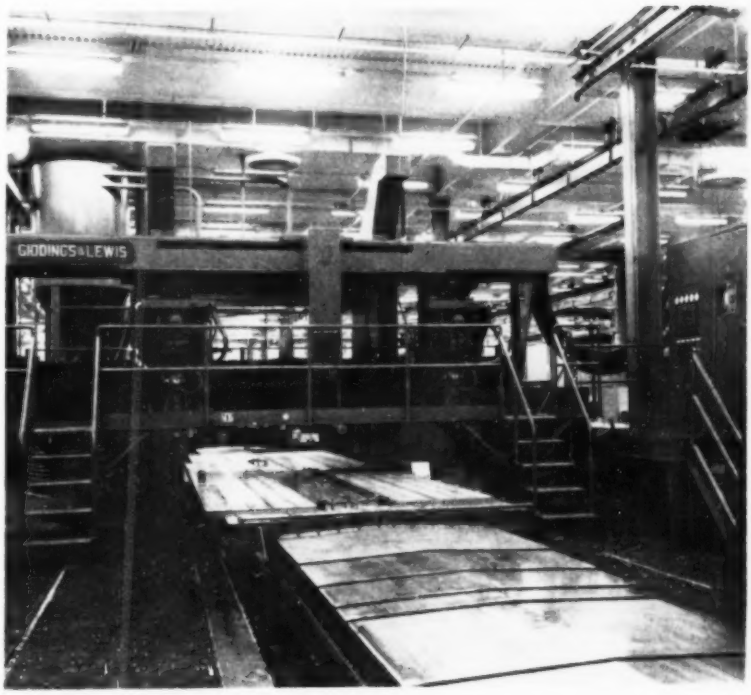
How the Director Works

The director rearranges data from individual code characters on the paper tape, translating them into machine tool commands in terms of actual operating time. The director can also, for example, slow the cutter down as it makes a turn on an inside cut.

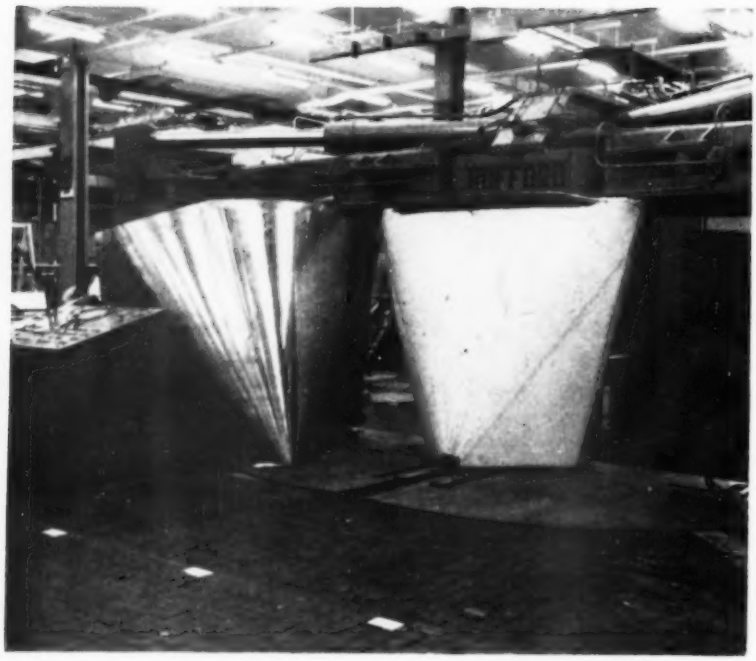
Control of such machine motions as longitudinal table travel, cross table feed of left and right heads, and rise and fall of the heads in turn assures complete control of the cutter path. Along with this, 22 auxiliary commands turn coolant on and off, collect chips by vacuum, do vacuum chucking and perform several other operations.

At the machine, the magnetic tape is installed in a GE computer that controls the machine with a playback reader. Here coded data are translated into electrical impulses that control cutter paths and operate the solenoids that run auxiliary functions.

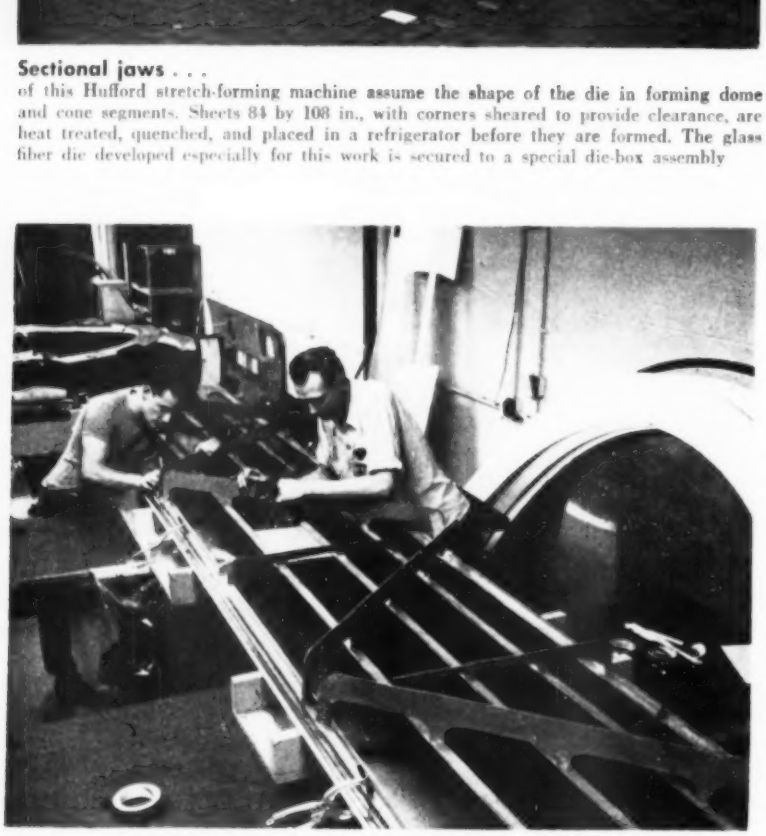
The cutter is aligned, after its



Possibility of human error is reduced . . .
by this five-axis, tape-controlled Giddings & Lewis skin miller. Other advantages of this machine over conventional methods: reduction of non-cutting intervals, shorter setup time, less time needed for manual positioning, easy filing of machine control data for re-use. Machine's special features include two 2500 cfm chip collectors, a vacuum chuck, and a "rolling bridge" catwalk



Sectional jaws . . .
of this Hufford stretch-forming machine assume the shape of the die in forming dome and cone segments. Sheets 84 by 108 in., with corners sheared to provide clearance, are heat treated, quenched, and placed in a refrigerator before they are formed. The glass fiber die developed especially for this work is secured to a special die-box assembly



Propellant tank sections are accurately scribed . . .
. . . before chemical milling (see next page). Maskant is trimmed to protect those areas not to be milled. But even with these manual preparatory operations, Martin-Denver finds that chemical milling has distinct advantages over conventional machining in producing several types of missile components

starting point has been established with a holding fixture, and the work is clamped down. From then on the whole procedure is automatic and the cutter returns exactly to the starting point, or picks up any required position. Cutters are carefully checked and replaced before they wear out to insure that tolerances are maintained.

Chemical Vs Machine Milling

At Martin-Denver chemical milling has been found to have a number of advantages over machine milling on some Titan parts. For instance chemical milling can be applied *after* forming, whereas conventional milling is limited to flat or only-slightly-contoured parts.

Too, chemical milling is not limited to part shape, direction of cut, or radius of cutter. Complex shapes, broad and/or narrow cuts, and relatively sharp corners may all be milled chemically in a single operation. And metal can be removed simultaneously from both sides of a part, reducing the warpage that is common when both sides of a sheet are machine milled.

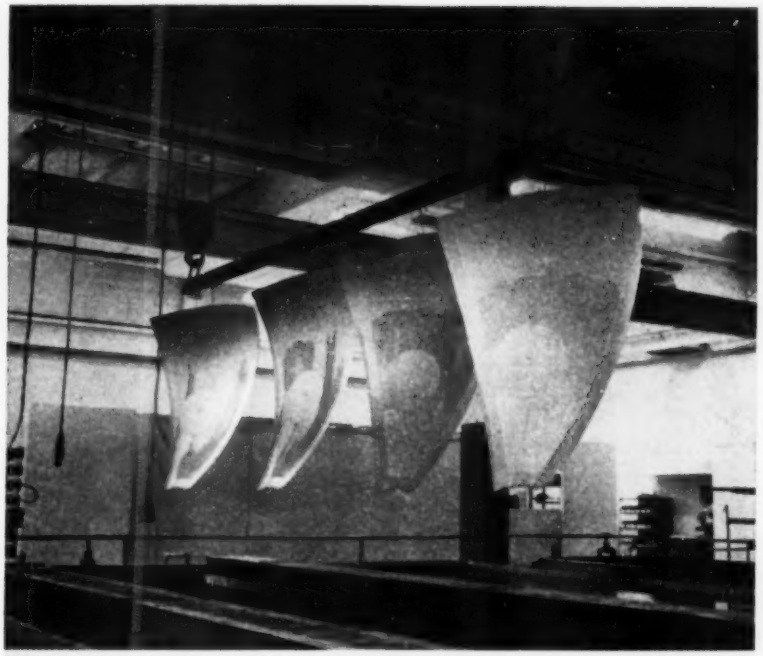
With chemical milling, Titan components can be lightened through use of built-in bands or stiffeners that can be curved or otherwise contoured to transfer stresses as desired. Fittings, separate stiffeners, doublers and fasteners are thus eliminated. Thickness tolerances may be held without special holding fixtures, and chemical milling may be applied to production of tapered sheets, extrusions, various formed sections.

Chem-Milling Advantages

Chemical milling has its economic advantages, too: operators needn't be highly skilled, the quantity of parts that can be milled simultaneously is limited only by their shape and the size of the tank, and chemically milled parts do not require such extra operations as sanding or polishing.

Martin-Denver is currently milling parts up to 10 x 26 ft chemically—provided their shapes do not include areas in which gas could be trapped. Facilities include an alkaline cleaning tank and a rinse tank, a 28-ft deoxidizing and desmutting tank and rinse tank, a chemical milling tank and rinse tank; and mask application, mask curing oven, and demasking equipment.

Welding of Titan components can be tricky, is done automatically with special equipment. An example of this is the welding of two different



Automatic welding head . . .
. . . for continuous cylindrical welds takes just one-tenth as much time as manual welding. Spherical pressure vessels for the Titan are made in this setup by joining stainless steel hemispheres

pressure vessels, one a 12-in. sphere and the other an 18-in. sphere, both made from 321 corrosion-resistant steel 0.080 to 0.125 in. thick.

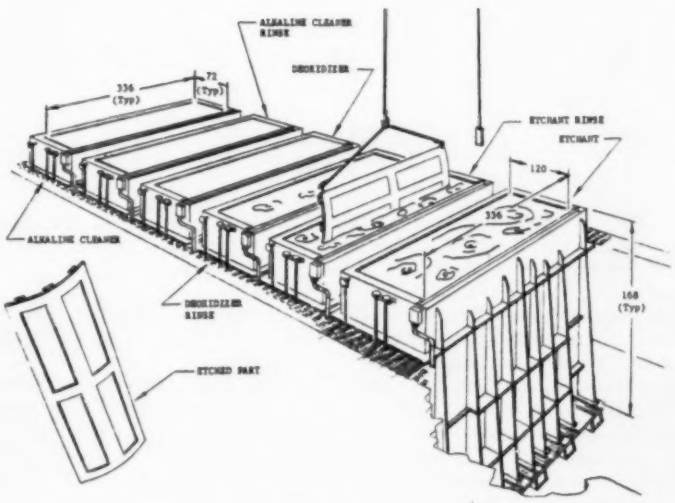
Each sphere is made by joining two hemispheres—a job that until recently was done manually and involved a lot of rework. It took about four hours for manual welding of the 18-in. sphere, and weld penetration was frequently so unsatisfactory that a great deal of repair welding was necessary.

Inert-Gas Welding

Today, Martin uses a modified d-c Airco model C automatic, equipped with a water-cooled torch, and a thoriated tungsten electrode. Argon gas shields the weld beads, and a feeder delivers filler wire to the joint at a rate of 16 to 210 ipm. Helium is employed as a trailer and as an internal purging gas. Detail parts are assembled in a universal trunnion fixture, then completed with a one-pass weld.

Result: spheres are now completed in 24 minutes instead of four hours, penetration is much better, and sound weld joints now require no rework or repair.

Chemical milling is a big money and time saver at Martin-Denver



Chemical milling of aluminum alloy panels . . .
such as those shown in photo at top, takes place in six tanks (see diagram). Tolerances of ±0.003 in. are held on depth dimensions. Etch rate may be as high as 0.001 ipm over the whole unmasked area

Experimental tumbling room where new information is being developed on the effects of barrel finishing—good and bad—on product quality

BARREL FINISHING:

What it does to service life

By L P Tarasov, Research and Development Department, Norton Co, Worcester

Abrasive tumbling can affect product quality by changing the physical condition of the surface. Some effects are desirable while others are not:

• **1. The fatigue limit is likely to be raised** regardless of its value prior to abrasive tumbling. This operation residually stresses a thin surface layer in compression and also strengthens it through cold work, both effects being responsible for the improvement in fatigue strength.

• **2. Metal whose surfaces have been cold worked by abrasive tumbling may be somewhat more resistant to punching.** This cost of resharpening the punches more frequently, however, is likely to be less than the savings associated with abrasive tumbling.

• **3. The elastic limit may be reduced** by abrasive tumbling. The reduction is of practical importance for small springs and the effect can be eliminated by a stress-relieving treatment.

• **4. Abrasive residues left on the work surface can reduce the life of cutters and punches** used on abrasive-tumbled parts, as well as the service life of the parts themselves on account of more rapid wear, and can also lead to difficulty in brazing and resistance welding. Such difficulties can be eliminated with suitable compounds that prevent the adherence of extremely small abrasive particles to the work surface, and through improved cleaning procedures after abrasive tumbling.

For many years, the quality of an abrasive-tumbled part was judged entirely by its geometrical and visual characteristics. The principal ones were burr removal, edge rounding, surface "color" or appearance, and sometimes surface roughness. These items are still important, as are the economics of the operation, but with increased use of abrasive tumbling or barrel finishing in the processing

of high-strength parts, such as those going into jet engines, some other aspects of the operation have become equally important. Both experimental studies and practical experience have shown that abrasive tumbling can change the physical condition of a thin surface layer, and this in turn can affect the mechanical properties and the service life of the finished parts as well as the response of the material to further processing. The effects can be good or bad, but the bad ones can be overcome by one means or another.

Residual stresses

When a metal is machined or ground, the surface is left in a cold-worked and residually stressed condition. The same is true of operations in which much less stock is removed, such as lapping or abrasive tumbling. Cold working involves strengthening and hardening a metal by plastic deformation. Residual stresses are essentially forces left within the metal by operations as diverse as mechanical processing, heat treating, and electroplating. If these internal stresses are not properly balanced, they can result in various types of distortion. Even if they are balanced to begin with, the removal of a stressed layer from one side of a bar or strip will cause it to bend until the remaining residual stresses are again in balance. Moreover, if the residual stresses are high enough and are tensile, they can lead to the formation of cracks, either immediately or at some later time. Cold work occurs on a microscopic scale, while residual stresses are reasonably constant over much larger distances within a given surface layer.

Fatigue strength is a mechanical property that can be affected by cold work and by residual stresses. Any metal will fail at a lower load when the load is fluctuating than when it is constant, and such failures are said to be due to fatigue. A typical example familiar to everyone is a spring which breaks suddenly after many repeated deflections well within its elastic limit. Fatigue is of great practical importance because experience has shown it to be the most common source of failure of machine and structural parts. The fatigue strength of a metal may be increased by cold working it or by residually stressing it in compression. Residual tensile stresses, on the other hand, may reduce the fatigue strength.

Bearing cages that have been barrel finished without trouble from abrasive charging

Improvement of fatigue strength

Abrasive tumbling produces high residual compressive stresses in a shallow surface layer and an improvement in the fatigue strength of hardened steel.* This has been shown for flat test bars that were surface ground under good commercial grinding conditions, which resulted in moderately high residual tensile stresses. It has also been shown for specimens that were ground the same way except that the water emulsion of soluble oil previously used was replaced by a sulfurized grinding oil, the resultant grinding stresses now being compressive instead of tensile.

The test bars, made of AISI 52100 steel hardened to R_c 59, were tumbled in an octagonal barrel for four hours with No. 0 fused aluminum oxide abrasive, whose particle size is mostly in the range of 1 to 1½ in. Trisodium phosphate was added to the water to make it alkaline and thus to prevent rusting. **This operation changed the maximum residual stress from 50,000 psi tensile for the bars ground with soluble oil to 250,000 psi compressive.** The fatigue limit, which is the highest applied alternating stress that a steel can withstand indefinitely, was increased from 73,000 psi, the normal value for this steel for the particular test conditions, to 85,000 psi. It should be noted that abrasive tumbling did not result in stress relief as is sometimes erroneously believed, but in a substitution of new residual stresses for those originally present.

For the bars that had been ground with oil, the same abrasive-tumbling operation **increased the maximum residual stress from 90,000 psi compressive to 170,000 psi compressive,** and the fatigue limit went up from 91,000 psi to 103,000 psi. It was considerably above normal for the ground condition and it went even higher as a result of tumbling.

The maximum compressive stress after tumbling was lower for these bars than for those ground with soluble oil, but the fatigue limit was higher. It is believed that this and other results, in which the fatigue limit does not change in the expected way with the magnitude of the residual stress, should be attributed to differences in the cold-worked condition of the surface, since it is known that cold work can affect fatigue properties to a marked extent.

Even when grinding is abusive enough to lower the fatigue limit appreciably, abrasive tumbling can so strengthen the damaged surface that the fatigue limit is raised above the normal value obtainable under good grinding conditions. For example, the fatigue limit of bars similar to

* This is described in detail in "Effects of Grinding Direction and of Abrasive Tumbling on the Fatigue Limit of Hardened Steel," by L P Tarasov, W S Hyler, and H R Letner, American Society for Testing Materials, Preprint No. 71, 1958.

BARREL FINISHING . . .

those described above but heat treated to a lower hardness (R_c 45) was 60,000 psi when properly ground. Grinding with much too hard a wheel reduced the fatigue limit to 45,000 psi but when grinding was followed by abrasive tumbling, the fatigue limit went up to 78,000 psi.

Effect of abrasive size

Abrasive in sizes smaller than No. 0 can be used with equally good results from the standponit of fatigue. For example, the same maximum residual compressive stress and the same improvement in the fatigue limit resulted when bars ground under good commercial conditions were tumbled with No. 4 abrasive, about ¼ in. in size. It has even been reported that the fatigue limit of spring steel strips was increased by 10% when they were tumbled in sand to clean them up. Thus when parts are tumbled to improve their fatigue properties, the proper abrasive size or sizes can still be selected on the basis of the usual considerations, such as meeting the surface finish requirements and keeping the abrasive from wedging in holes and slots.

Other metals

It is reasonable to expect that the beneficial effect of this operation upon the fatigue limit is not restricted to hardened steel, where the improvement is associated with the residual compressive stresses and cold work that result from abrasive tumbling. Similar stresses of appreciable magnitude have been found in steels that have been heat treated to lower hardness levels, including the annealed condition, and also in an aluminum alloy. As for evidence of cold work, microhardness measurements have shown the surface hardness of an abrasive-tumbled piece of soft steel to be about 50% greater than that of the interior, with the hardness decreasing to its original value at a depth of 0.002 in. Other metals can hardly escape being cold worked and residually stressed in compression when they are abrasive tumbled, and hence their fatigue strength should also be improved by this operation. It is important to select the right type of compound for each metal so as to avoid pitting, which may reduce the fatigue strength below its normal value for the material.

Change in elastic limit

There is one mechanical property, the elastic limit, which may be adversely affected by abrasive tumbling. It has been found that the elastic limit of thin spring-steel strips was reduced appreciably when they were tumbled in sand, although their fatigue limit went up. This effect is not peculiar to tumbling since it is also found to occur in connection with shot peening and other operations in which the surface is plastically deformed. It is of importance only for small springs since the elastic limit is reduced throughout an appreciable portion of the cross section and this would cause them to take a permanent set as soon as they were used. This can be prevented by heating the springs to relieve the residual stresses and restore the elastic limit to its original value. In reasonably large springs, however, there is no noticeable set since the affected layer is so thin in relation to the cross section.

Abrasive residue

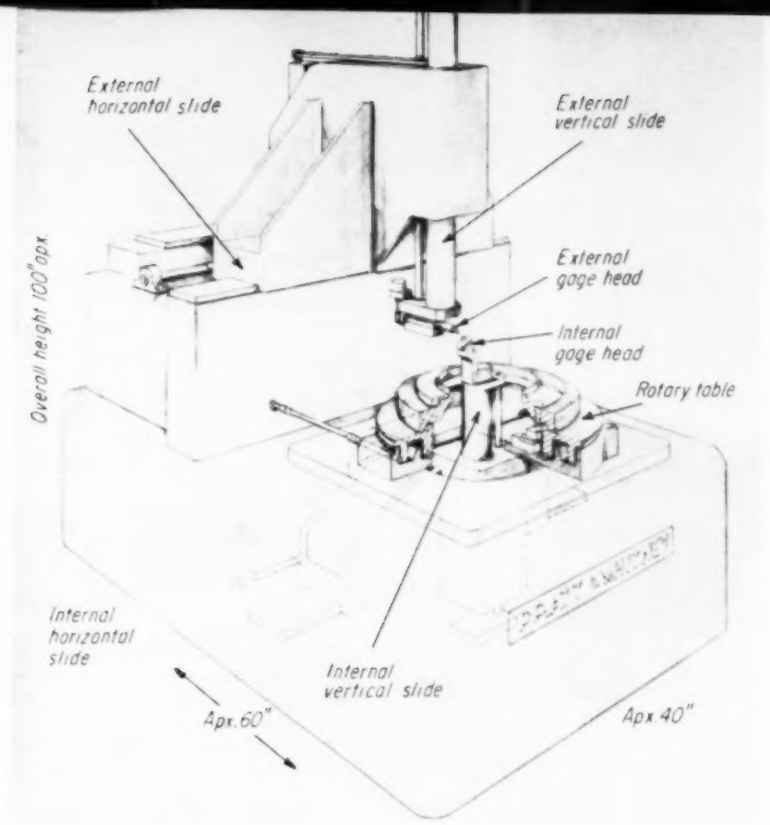
Another way in which a surface can be affected by abrasive processing is for it to become coated or impregnated with extremely fine abrasive particles. In loose-abrasive lapping, a cast-iron lap is purposely charged with an abrasive compound so that it will function properly, but fine abrasive particles left on the work after it has been tumbled can be harmful. Whether they are forced into the metal itself or just adhere to the work surface, they can score a mating surface and cause excessive wear. **If enough of the surface is covered with abrasive, it can interfere with successful brazing or resistance welding.**

That abrasive charging can be successfully prevented is shown by the experience of a number of antifriction bearing manufacturers. Races, rollers and bronze cages have been tumbled for several years with aluminum oxide abrasive without any detrimental effect on the life of the bearings. This application is certainly a highly critical one since excessive wear would result from abrasive particles adhering to the surface or imbedded in it. The absence of any difficulty can be attributed to the use of suitable compounds which prevent adherence of fine abrasive particles to the surface, and to thorough cleaning of the surface after the operation has been completed.

Abrasive-tumbled parts should not be left in the barrel even for a short time after it has stopped because fine abrasive particles can settle out on the surface and form an extremely adherent coating which is very difficult to remove. The compound used in the tumbling barrel can be very important from the standpoint of surface cleanliness since even thorough cleaning may be insufficient if the compound is unable to prevent the abrasive fines generated in the tumbling operation from adhering strongly to the work surface. Compounds differ greatly in this respect and it is necessary to use those that are formulated with suitable wetting agents, which can prevent the deposition of strongly adherent particles. This is illustrated by some tumbled copper parts to which abrasive particles roughly 0.001 in. in size were so firmly attached that they could not all be removed even by scrubbing with a stiff brush in a soap solution. However, a change in the tumbling compound eliminated the abrasive residue from the surface of the next batch of parts.

It has been observed occasionally that the life of cutters and punches was appreciably less if the parts to be processed had been abrasive tumbled. In one instance, in which careful records showed that the milling cutters dulled too rapidly, it was found that their life went back to normal when the parts were cleaned properly after abrasive tumbling. Insufficient cleaning can also result in low punch life, but there is a possibility that some of the reduction in life is due to the presence of a thin surface layer that has been considerably hardened by cold work, as mentioned previously.

Some abrasive particles may be forced into the surface, especially if the material is soft, so that they cannot be removed except by etching away a thin surface layer. It has been extremely difficult to establish their presence, apparently because they are no larger than levigated alumina particles, such as are used for the last stage of metallographic polishing to produce a mirror finish. Particles in this size range are much too small to cause any scoring of mating parts.



6-axis measuring machine . . . strongly resembles a machine tool because this structure has proved best to provide rigidity and vibration damping. Using P&W-jig-borer tape-control system, machine will repeat to 0.000050 in. accuracy. Two gage heads can measure wall thickness, working together, or one will take outside measurements while the other probes internal dimensions. All drives are electro-mechanical

Tape-controlled "inspector" measures in six axes

By William M Stocker, Jr, senior associate editor

Multiple inspection operations, to close tolerances, on a surface plate, always add up to a time-consuming chore—a production bottleneck fraught with the danger of an oversight. Out of the Gage Division of Pratt & Whitney Co, Inc, West Hartford, Conn, comes an answer in the form of a numerically controlled inspection machine. It positions a probe, measures deviation from a known or desired preset dimension, computes the amount of error, and identifies reject conditions.

If you are one of the fortunate few shop men who have just figured a way to put one over on the inspector, just try to fool this one! With an overall accuracy, total, better than 0.000150 in. and repeatability within 0.000050 in., P&W's six-coordinate measuring machine will pinpoint any location within its reach.

Based on the principles employed in the production-proved P&W numerically controlled jig borer, the gage heads on the measuring machine can be controlled in the x, y, and z coordinates for horizontal, traverse and vertical motions as well as radially around each of these coordinates. Punched paper tape provides the input information.

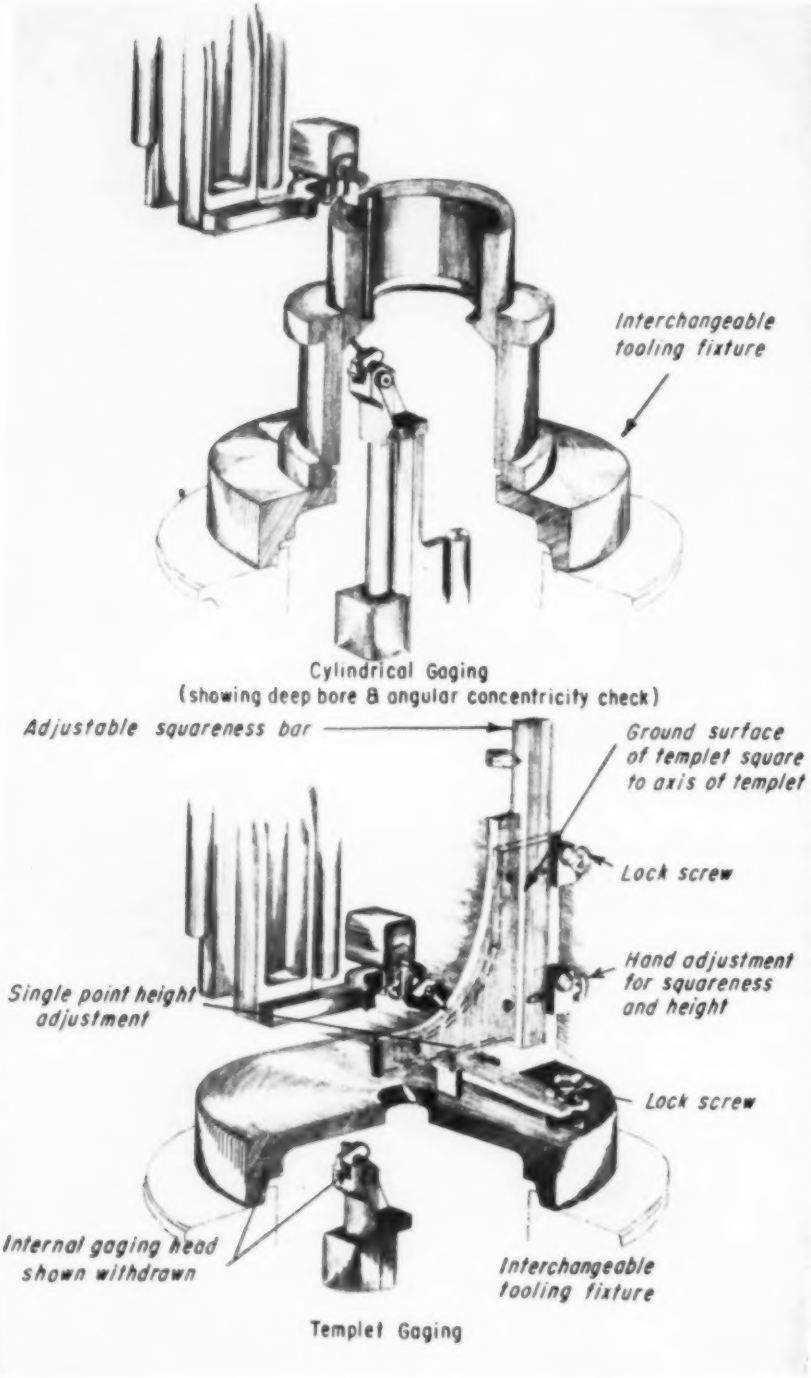
At present the equipment is not priced for crude measurement. It is intended for operations where many points must be measured to close tolerances on complex shapes. The company expects to find its initial market among builders of airframes and aircraft engine parts, missile components, rocket nose cones, oil-well drill bits, templets, and ordnance equipment. Simpler machines for inspecting conventional castings and similar components may be forthcoming as the program gets underway.

One advantage of the machine is typical of virtually all numerically controlled equipment: Practically no tooling or setup is necessary. The part to be inspected is placed in the machine and the probe is set to a "zero," or starting, point; then the operation is ready to go. Automatic positioning makes possible exploration of the part to a degree impractical by manual methods using height gages, raising blocks, surface plates, etc.

Can the machine be used for layout? Yes, with slight modifications, if it is necessary, but in general the same tape that is used to make the layout could be prepared to program a numerically controlled machine tool and machine the part directly, thus avoiding the layout step.

Maximum range of the present machine is 24 in. dia by 20 in. high; minimum range is a diameter of 6 in. and a 3-in. height. Sequence for inspecting a hollow cylinder under

Tape-controlled "inspector" . . .


Interchangeable tooling fixture
Cylindrical Gaging
(showing deep bore & angular concentricity check)
Adjustable squareness bar
Ground surface of templet square to axis of templet
Lock screw
Hand adjustment for squareness and height
Single point height adjustment
Lock screw
Internal gaging head shown withdrawn
Interchangeable tooling fixture
Templet Gaging

Gaging arrangements . . .
for cylindrical and templet dimensions. Machine is capable of gaging heights, lengths, flatness, parallelism, squareness, concentricity, inside and outside diameters, and angular surfaces plus their angles. Simple fixtures permit many different setups

automatic programming might be:
1. Upon pressing the cycle-start button, the program control would release the first block of position information from the tape reader. Both gage heads would drive to the first measuring position and stop.
2. Automatically, readout equipment is turned on and a reading is printed out by an automatic typewriter.
3. The table carrying the product rotates through a fixed increment and a second reading is recorded. This process continues until readings have been recorded throughout the 360 degrees.
3A. Instead of step 3, the table could rotate through 360 degrees and, at the end of the rotation, computing equipment would print out the minimum and maximum dimensions encountered during the rotation.
4. Program control releases another block of information from the reader and gage heads travel to a new position. Steps 2 and 3 repeat.
5. When the last position has been reached, presumably near the top of this cylindrical product, and all of the readings are recorded, both gage heads return at high speed to starting point, ending the program. Pressing the cycle-start button will repeat program for next piece.

Direct-measuring controls

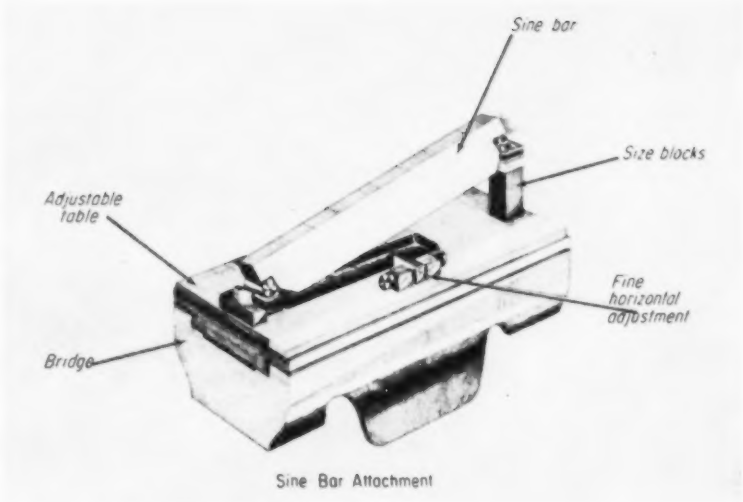
For control, a digital discrete positioning system is used. It also provides direct reading and *direct measuring*. Not much can be gained by high-speed inspection if the results of the system used do not give the required accuracies. Similarly, time gained by a high-speed inspection system can be lost again if the records obtained cannot be cataloged in an orderly system using a minimum of space.

According to Paul Cherkas, chief engineer of the gage division, the digital system used to control the measuring machine is simpler than an analog system capable of the same performance. He says that it is also more capable of accuracies in the range of 0.000050 to 0.0001 in. than an analog system because:
1. Information can be read in very accurately.
2. The transducer, or feedback, device is equally accurate with the input device and can be made as accurate as is required.
3. All positions of measurement are approached from the same direction and at a constant velocity, minimizing effects of slide friction.

Preset position information is fed to the measuring machine from the

punched paper tape media through a tape reader. The proper positions are reached by a rectangular coordinate system of slide movements in the x and z directions. A third movement, #, representing rotation of the gage head, is required so that measurements are always taken normal to the product.

With the gage heads in the predetermined positions, and the product within tolerance, a zero deviation will appear on the deviation indicators. This deviation information can be fed into any automatic typewriter or printer, which will print out the *direct* reading of the three dimensions (external, internal, and wall thickness) by adding the deviations to the known preset required dimensions.



Sine Bar Attachment

For setup and checking . . .
angular specifications, sine-bar attachment can be mounted on rotary table of measuring machine

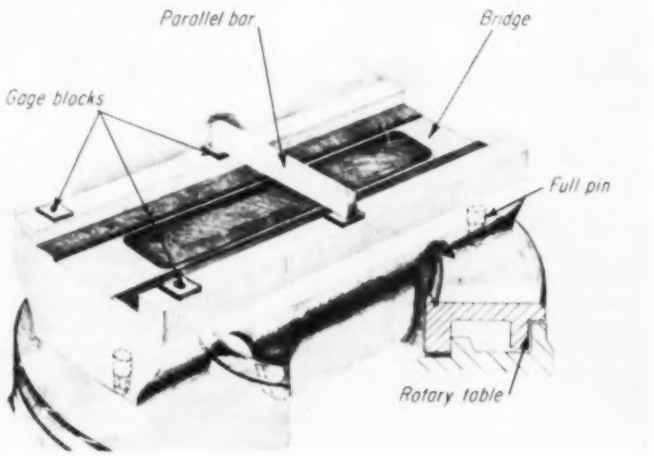
Operational sequence

If the "z" direction for one of the gage heads is taken as an example, this is the order of events: The tape reader and the buffer storage unit will feed positional information to *two* digital-to-analog converters which convert the information into electrical signals. Two converters are used to divide the positioning process up into steps of increasing resolution. This ability means that less accurate, hence less expensive, converters can be used to provide a highly accurate response.

Information to position the slide to the accuracy of the first three digits (AB.C) is supplied by the electrical output of the first converter. Positioning is accomplished by driving the "z" slide directly through a motor and gearbox, and decreasing the error to zero with a feedback potentiometer.

Electrical output of the second converter goes to a micrometer-screw control which drives an Electrolimit gage head relative to a master bar which is permanently attached to the slide. This master bar has a series of ½-in. sections cut out along its edge to leave a succession of ½-in. blocks. Adjacent blocks have a distance between centers of precisely one inch. Total accumulated error in the length of the bar is less than 0.000020 in.

The micrometer control handles the remaining digits (.CDEFG, picking up the C from the first converter) and further breaks these up into CD and EFG increments, feeding them separately into an accurate differential in the micrometer drive. The positioning electric head also feeds its information into the "z" slide control.



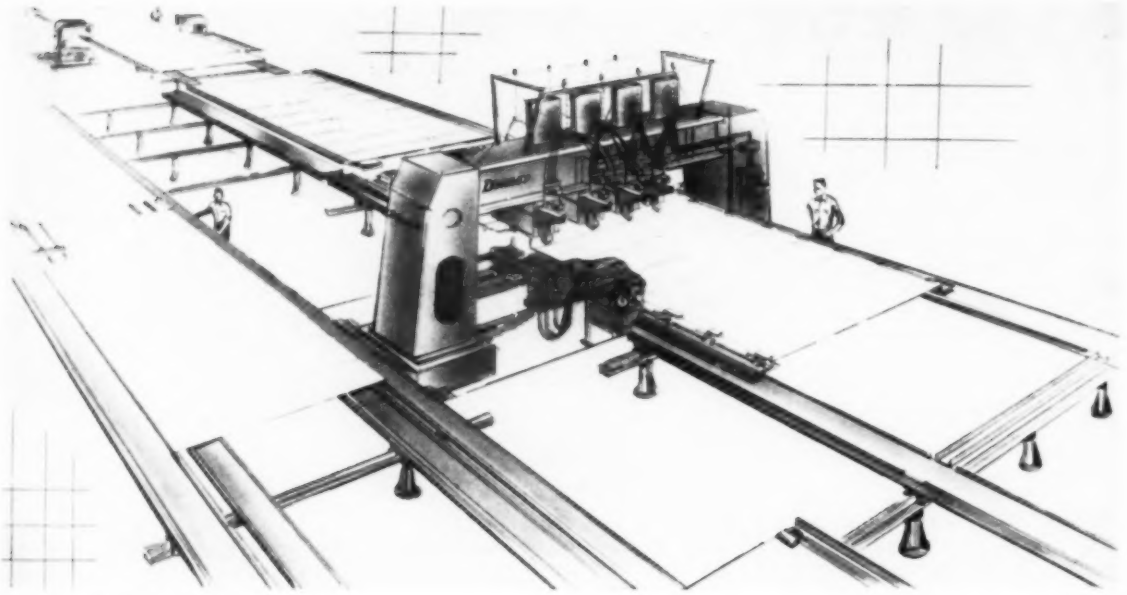
Master fixture . . .
is used to set zero position of vertical coordinates

Total movement of the "z" slide, then, results in part from direct control and in part from the control inserted by the micrometer-screw system. Movement is handled in speed phases hence the final approach to position is very slow.

Movement along the "x" axis is controlled by an identical system. The master bar is permanently attached to the "x" slide.

A third analog-to-digital converter is used to convert information from the tape into an electrical analog signal for controlling rotation of the gage head, insuring that it will always be normal to the product at any position. This movement does not have the accuracy requirements of the "x" and "z" movements hence it is produced by driving a motor directly which, in turn, drives a feedback potentiometer to null out the inserted information.

Motors in the base of the machine are ventilated to prevent heat distortion problems. Similarly, P&W recommends that the machine be installed in a temperature controlled room, and a separate foundation is advisable where extreme accuracy is required.



Panels for truck trailers . . .
feed straight through riveter throat as cross posts are assembled. Longitudinal braces are added on tables to rear, then three smaller riveters complete the panel assemblies. Trailer tops and sides are built the same way

Automatic riveting at 80 shots/min

Trailers for highway trucks are now assembled with a unique four-headed riveting machine that indexes, drills, inserts, and drives rivets at the rate of 80/min. The machine was recently installed by Dorsey Trailers, Elba, Ala, as the first production unit on a 300-ft high-speed manufacturing line. The big riveter, plus three smaller single-head units that work at 20 rivets/min, can assemble all the 6000 rivets required for a trailer side or roof panel in an hour.

Assembly begins at the big machine, where aluminum panels with posts in place are rolled under the four heads, then:

- Upper and lower pressure feet squeeze posts against the panel.
- A drill at each head drills a rivet hole, then moves out of the way.
- Rivet injectors place rivets in anvil fingers, which move over the holes and insert the rivets.
- Upper anvils close down on the rivets and lower anvils come up and set the rivets.

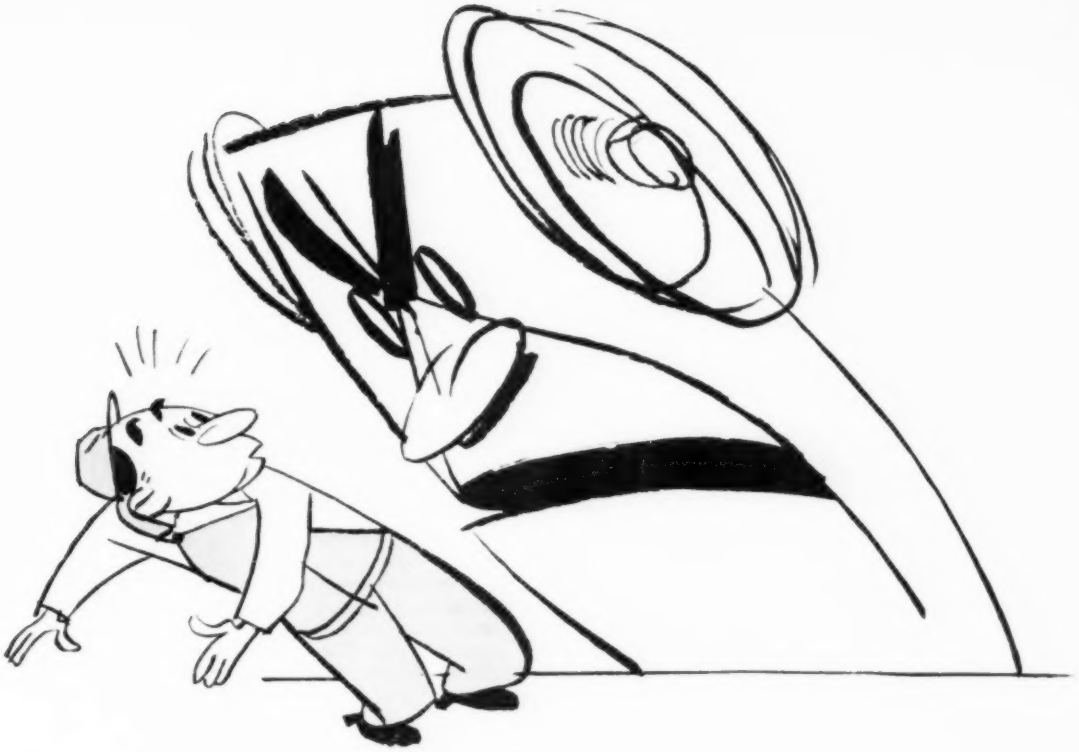
Positioning of drills, anvils, injectors, and fingers is automatic. Drilling locations are controlled by photocells that read an indexing templet located below and in front of the lower anvils. The pattern of rivets can be altered almost infinitely by changing the pattern of holes in the templet.

After posts and sheets are assembled by the big riveting machine, the panel moves down intermediate tracks where workers add longitudinal members. At the end of the riveting line, the three smaller single-head machines drive rivets to assemble the longitudinal members.

Total output of the four machines is 140 rivets/min in an installation that cost $500,000. The system was built by General Riveters, Inc, Buffalo, NY, to Dorsey specifications. Normal rivets are ½ in. long, 3/16 in. in dia; but the machines will handle rivet diameters up to ¼ in. Aluminum stock for trailer bodies is usually ½ in. thick, but the equipment can work with ¾-in. stock.

Savings with the new system are figured at about $100 per trailer over all-manual riveting—which averaged only one rivet/man/min. Work is better and neater because the machines eliminate burrs, chips, dimples, and work misalignment.

Quad-head riveter has templet and photocell control, plus a control console that cycles each head for drilling, feeding and rivet heading



How to plan SAFER SETUPS for your press department

By L A Faulkner,
supervisor, Industrial Plant Services, Liberty Mutual Insurance Co, Boston

American Machinist

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Increased production of stampings, particularly by mechanized and automated methods, is now posing new safety problems for the die designer, automation engineer, and the press-room supervisor.

The problem of preventing accidents to men and equipment is now much more extensive than it was a few years ago. True, the greatest accident potential is involved in first- or second-operation tooling. See "Don't Overlook Operator Safety in Press Tool Design," (*AM*—Sept 1, 1952, pp 121-136). **New hazards of a different nature or degree have been added by increased use of mechanized or automated setups.**

An ideal press setup is one in which the press itself and its tooling and feeding equipment have all been designed and tested to eliminate all hazards to operators, die setters and maintenance men. However, this ideal is not approached in many situations, because top management and shop management are unwilling to pay the price of the additional safety features or fear that they will hamper production. Fortunately, the design of mechanical presses in recent years has had two main objectives: (1) to provide much greater productivity—200 to 500% in some instances over presses built 10 to 15 years ago, and (2) to protect the machine, the operator and the die setter.

A great deal remains to be done to reduce the costly effects of press-room accidents. Under modern conditions, the real cost of an accident is not confined to the cost of a smashed die, a broken press, or an injury to personnel. The tendency is for costs to mount, as the effect of the accident spreads to hinder or interrupt production of a press line or an assembly line. For this reason, the purpose here is to augment the previous Special Report on guarding and feeding of first- and second-operation presses, with emphasis on mechanized and automated setups. **The ideas presented are ones that you will need as safety codes and regulations are rewritten.**

SAFER SETUPS for your press department . . .

Primary operations still require safeguards and good die design

Automated operations may be safer than primary operations, but the latter will always be with us. They account for approximately 20% of press-room accidents to personnel.

Primary operations include blanking, piercing, parting, corner cutting, progressive die work, and simple compound die work. Such operations are most often conducted with strip or coil stock. The operator is not required to put his hands into the danger zone, but accidents do arise from a variety of causes. Presses running at 70 strokes per min or less are the most frequent sources of accidents, because the operator thinks he can beat the punch when:

1. Retaining his hold on an unfinished end
2. Using his hands instead of a pick to remove scrap or a part stuck in the die
3. Reaching through the die to remove scrap from the rear of the bolster plate
4. Placing the hands in the die while distracted or wool gathering

Press Guarding Program

To cope with the hazards cited, it is necessary to establish a well-balanced program of press guarding and designing dies with safety features. The program should be evaluated in terms of the number of presses in use and the types of presses involved. For a small press room, the foreman die-setter will develop a simple program for guarding the few dies in use and for installing press guarding facilities. In a large press room (20 or more presses) responsibility for safety may be split among several people. Company standards are now essential. These should be understood and followed by supervisors, die designers, die setters and maintenance people.

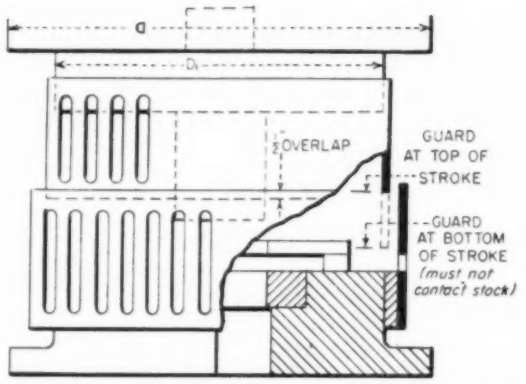
Effect of Press Types

The type and make of all presses must be considered. Small clutch-dog machines may present problems in the guarding of the die or provision of a press guard. The larger presses pose other problems that are solved by devices like constant-pressure two-hand trips, pull-back guards, etc. Here, the maintenance problem will vary according to the type and make of the press and should be in accordance with the manufacturers' specifications. Often, the press can be "mechanized" to improve safety.

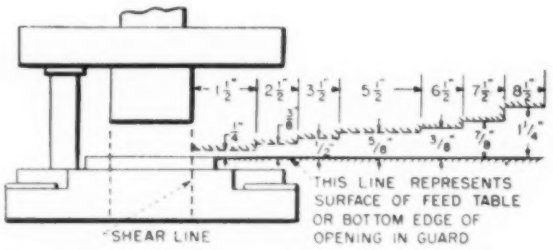
Die Inventory

The number of dies involved is a major factor in determining the extent of guarding. In addition, the quantity of active dies in the racks and in dead storage should be inventoried and considered.

If this inventory shows a large number of active dies and a dead storage supply of many more, consideration must be given the provision of die guards and feeds on those dies used for high-production operations. Naturally, the first step is toward safeguarding the dies most often in use. Adjustable press barriers should be used for the dies that are utilized for short runs or where it is impractical to otherwise safeguard them. Other devices should be installed for use on operations where feeds are not provided and barriers cannot be utilized.



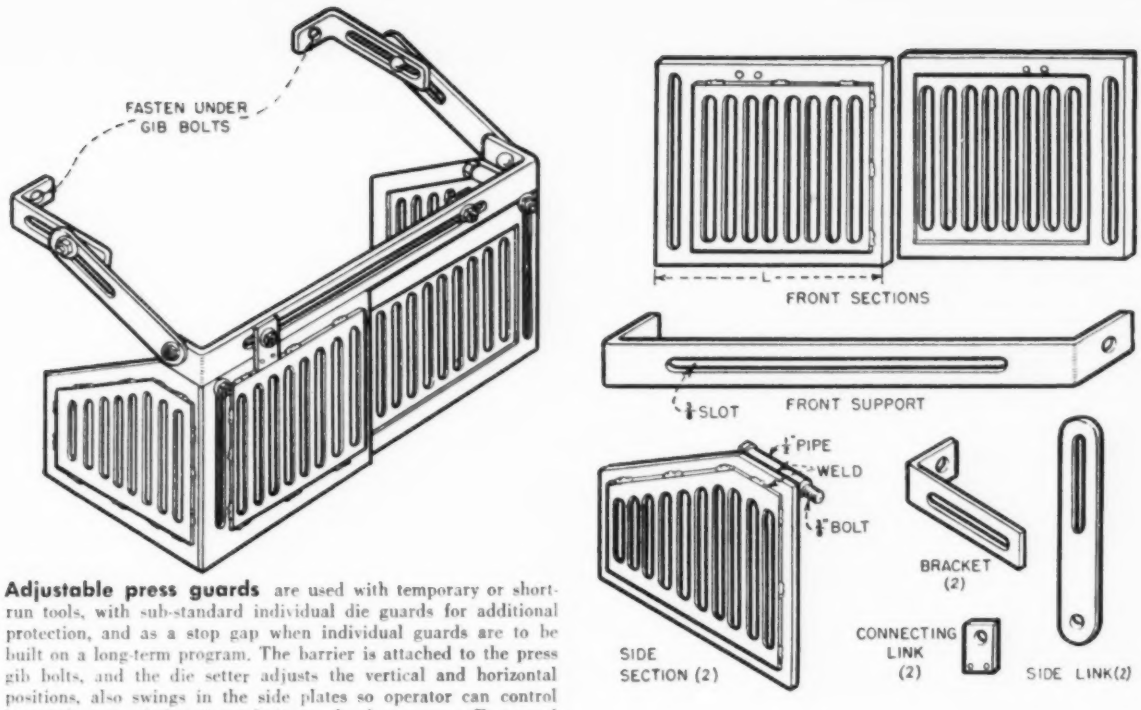
When tools must be changed often from press to press, consider a basic die guard that will provide protection with a minimum of change. When the length of the slide or ram D is greater than the length of the punch holder D_1 and the die shoe is the same length as the punch holder, a close-fitting die guard can be constructed in two parts. One section is installed on the punch holder and the other section on the die shoe



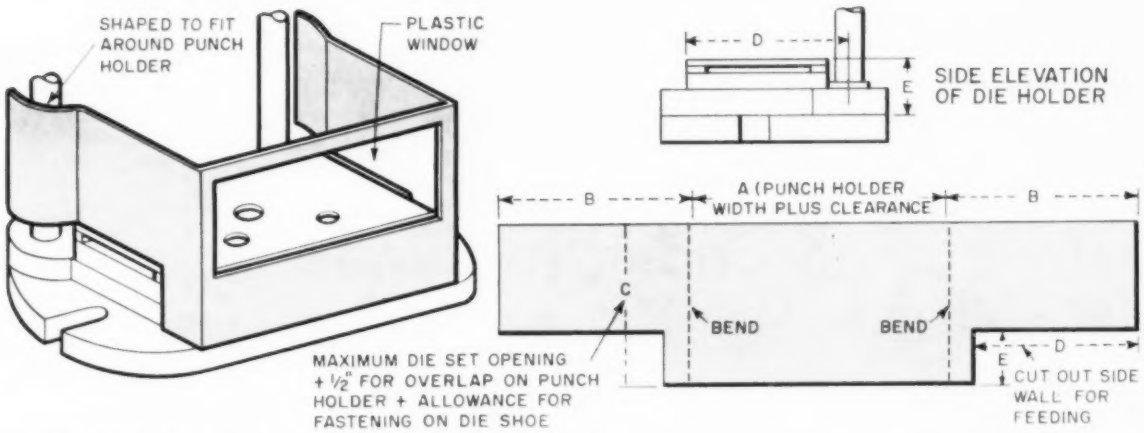
Safe openings in press guards bear a direct relationship to their distance from the "shear" line (where punch enters front of die). Vertical dimensions of the openings are based on preventing the operator's fingers reaching the shear point, even though guard contact is on back of fingers, hand or forearm. When installing guards with openings over ¼ in., make careful tests with operators, especially women, to make certain the guard is effective. Recommendations apply to vertical openings in guard, such as visibility slots, clearance slots for ejection devices and stock gages, and to all horizontal openings for feeding stock from front or sides and ejection of finished parts or scrap. Guard rear of die on presses of the straight-side type

Guarding Systems

The die designer has a distinct responsibility with respect to the safeguarding of primary operations by means of die guards and press barriers. The operator does not need to place his hands in the die between the punch and die. Hence, the means should be provided to make it impossible for him to do so. Guards are of two kinds: the *die guard*, which is a device permanently attached to the die; and the *press barrier*, which is at-



Adjustable press guards are used with temporary or short-run tools, with sub-standard individual die guards for additional protection, and as a stop gap when individual guards are to be built on a long-term program. The barrier is attached to the press gib bolts, and the die setter adjusts the vertical and horizontal positions, also swings in the side plates so operator can control his stock at a safe location relative to the danger zone. Front and side sections are adjustable



Straight-sided die guards can be formed from 24-ga sheet metal when the slide, punch holder and die shoe are the same size. The guard is fastened to the die block or die shoe and remains a part of the die at all times. It should be mounted with spacers to give 1-in. clearance between front of guard and any projecting breech-block nuts. Templet layout will be helpful, but remember that the guard must prevent hands from reaching over, under or through it

tached to the press itself, and is adjustable by the die setter.

Individual die guards provide the most positive protection for the operator. They should be attached to the die shoe or stripper in a fixed position. The design should be such that the operator cannot reach over, under or around the guard and into the danger zone, and that it provide easy feeding and good visibility of the die.

Adjustable Barriers

If a program to equip dies with individual guards will take some time to complete, or short-run tooling is being used, provide an adjustable press barrier on each machine used for such work. Die setters must be thoroughly instructed with regard to proper adjustment to prevent the operator from reaching into the danger zone. Operators must be forbidden to make any adjustment of the barrier at any time.

Combination Guards

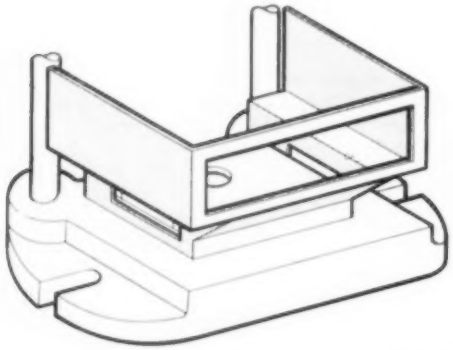
Sweep guards, pull-back guards, two-hand trips, etc. are generally not applicable to primary operations. These operations generally require the operator to hold the stock during the downstroke of the ram. Exceptions are

combination gate and barrier guards that are adjusted to allow the operator to hold the stock and use the treadle.

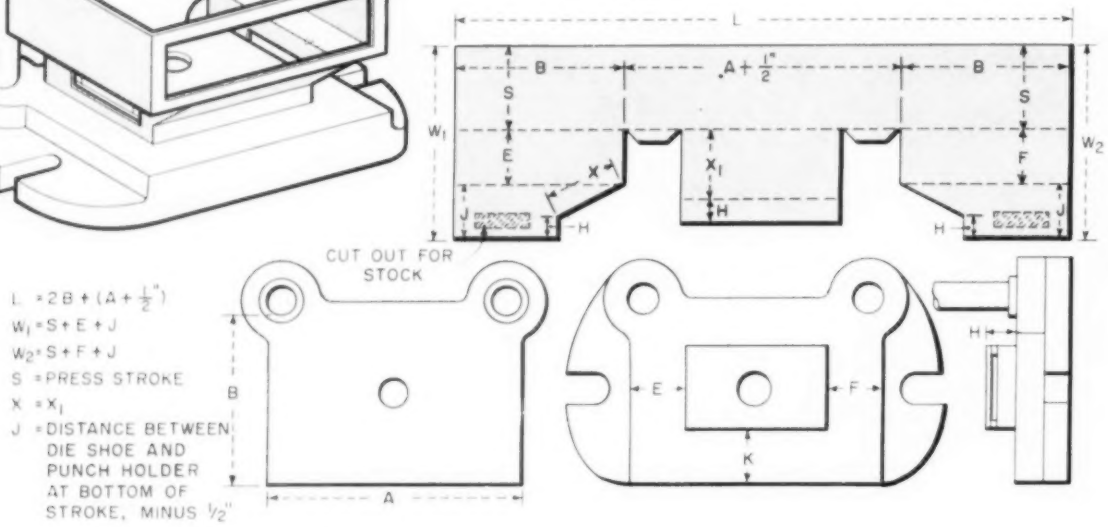
Importance of Strippers

In any program to design more safety into blanking dies, consider the stripper first. A plate-type stripper prevents the stock from sticking to the punch and can be designed to act as a guard. On short-stroke presses, a wide or thick stripper provides the necessary protection, because the punch does not leave the stripper on the upstroke.

When a combined pressure plate and stripper plate is installed on the die, the stock and part being processed are automatically raised to the top of the die on the upstroke, avoiding the need to reach into the die. An air-ejection device then helps to get rid of the piece, or the press is inclined and the part falls out by gravity.



A shaped sheet-metal barrier is necessary when dimensions of the ram plate, slide or punch holder exceed those of the die block or die shoe. Fasten the guard to the die block or die shoe with angle plates



Pay close attention to safety of secondary operations

From experience we know that the only way to eliminate punch press accidents is to eliminate under-the-punch feeding or ejection. Bending, forming, embossing, and coining are examples of operations where a blanked piece must somehow be placed in a die. Under-the-punch feeding by hand is an invitation to your workers to amputate their fingers. Almost four-fifths of accidents occur on these secondary operations, and mostly when presses operate at 70 strokes per min or less. At higher speeds, which now reach up to 1000 strokes per min, the likelihood is that a mechanical feeding arrangement, a transfer mechanism or fully automatic operation can and should be employed.

The chief reasons for press accidents on secondary operations are:

1. On the slower-speed operations, the operator may reach involuntarily into the danger zone if the part is located in the die the wrong way or two pieces have been inserted.

2. The ram may repeat because of inadequate press maintenance.

3. Many point-of-operation accidents have occurred because of unsafe practices like reaching around guards, altering the adjustment of guards and horseplay plus an accidental press stroke during one of these unsafe practices.

4. Operators disregard safety instructions and attempt to feed a piece to the nest between ram strokes, while riding the treadle.

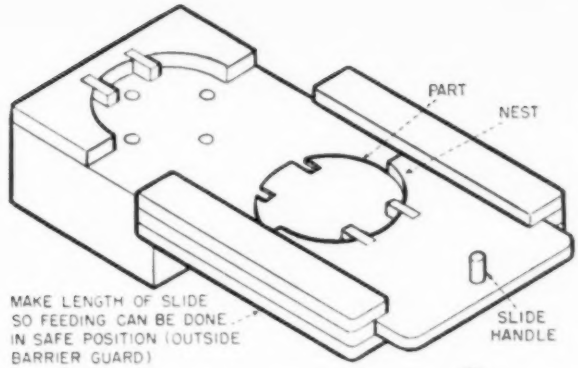
5. Wool gathering and fatigue, causing a lack of coordination.

Press-room safety is achieved through a combination of the die designer's effort and a good guarding program. The designer must consider both feeding devices and ejection devices, in an effort to keep the operator's hands out of the danger zone.

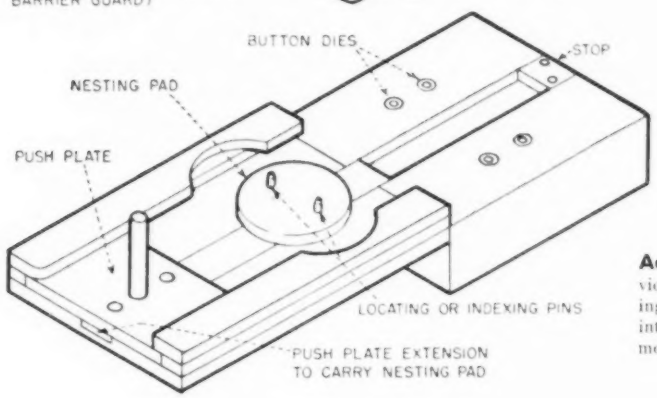
If feeding devices cannot be installed on short-run or temporary tools, equip presses with some type of universal press guard, such as a gate guard, pull-back guard, sweep guard or two-hand control.

What to Do First

The first consideration is the method of stripping the part so that it can be ejected from the nest. A stripper or a press knock-out should be provided. Now, with the part upon the pressure pad or in the nest, it must



Push feeds approximate hand feeding, but keep the operator's hand out of the danger zone, especially if the needed barrier guard is also supplied. The pusher is a plate that operates in a slide. By shaping the pusher, a nest is provided to orient the part with respect to the die opening. Use a stripper or knockout in the die for ejection of the finished part. Length of the slide should be sufficient to allow placement of the blank in the pusher nest at a safe position outside the barrier guard



Accurate indexing of the workpiece relative to previous operations can be attained by using a shaped nesting pad or indexing pins in the pad. The pusher can be interlocked with the press treadle to assure proper alignment with the punches

be removed to a tote box. Compressed-air ejection is a most efficient way of removing finished parts. And pusher plates actuated by an air cylinder in timed relationship to ram movement are satisfactory.

These devices get the part out of the die and the press without tempting the operator to reach under the punch. The operation of feeding the blank may be hazardous. To eliminate this hazard, provide a device that will position the part in the die without manual intervention. Simple feeds can often be attached to existing dies. They pay off in both increased safety and increased output.

Several types of feeds are rather simple devices:

1. Gravity feeds consist of an extended chute provided on the die. The part slides down the chute by gravity and enters the die nest. If the press can be inclined, the chute will be parallel to the die face. More rapid and positive control of parts is obtained if press-actuated stops release a piece at each stroke. Thus, parts can be magazined on the chute.

2. Push feeds are employed when an irregular part will not slide down a chute and orient itself properly in the die nest. The part is placed in a nest in a pusher slide and pushed until the two nests register and the piece falls into the die nest. An interlock is usually necessary so that the press cannot be operated until the slide has spotted the part accurately. Magazines are readily applied to push feeds.

3. Follow feeds are specified when the shape of the part is such that it can be used to push another like piece. This feed consists of a flat plate to which side plates have been fastened. The feed plate is kept full, and each piece fed pushes a finished part from the nest.

4. Magazine feeds of the manual type (as applied to push feeds) should be designed so that the stack of blanks is tilted. Then, if the blanks are slightly curved or have burrs, the parts do not become interlocked and the slide will operate freely.

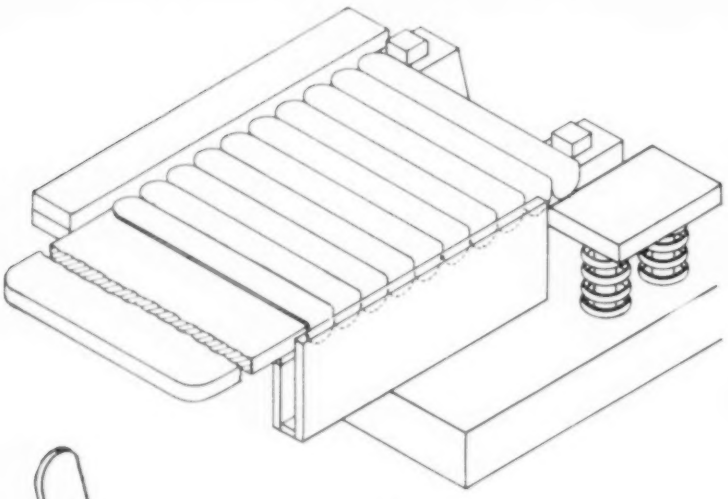
5. Automatic magazine feeds applied to push feeds should be interlocked with ram travel. An increasingly popular method of preventing ram motion, unless the part is accurately nested, is provided by precision miniature switches or air valves used in conjunction with solenoids or air-cylinder-latch tripping interlocks.

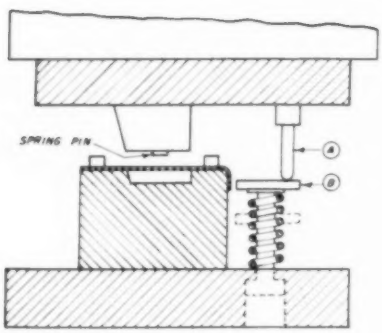
6. When the die is positioned on a pivot or slide, it can be loaded and unloaded outside of the danger zone and pushed to position under the punch, as determined by an interlock. This design is popular for riveting and other small assembly operations.

7. Dial feeds are available commercially for high-production operations. The part is placed in nests in the dial, and the dial indexes one position per ram stroke. Ejection is usually accomplished with pick-up fingers or compressed air.

Consider Guards

No program for increasing safety of secondary operations is complete without establishing means to prevent the operator from reaching into the danger zone for any reason. If an effective feeding arrangement has been provided, guarding usually consists of a barrier guard. But if the part must be fed by hand, piece by piece, guarding of the operation requires the installation of a guard operated by the press (sweep, pull-out, etc), or a press control (two-hand mechanical, electrical, pneumatic or various types of gate guards). Positive and effective nesting of the part without need for holding by the operator is imperative. Addition of nesting or supporting plates on many existing dies would eliminate need for the operator to hold the part.

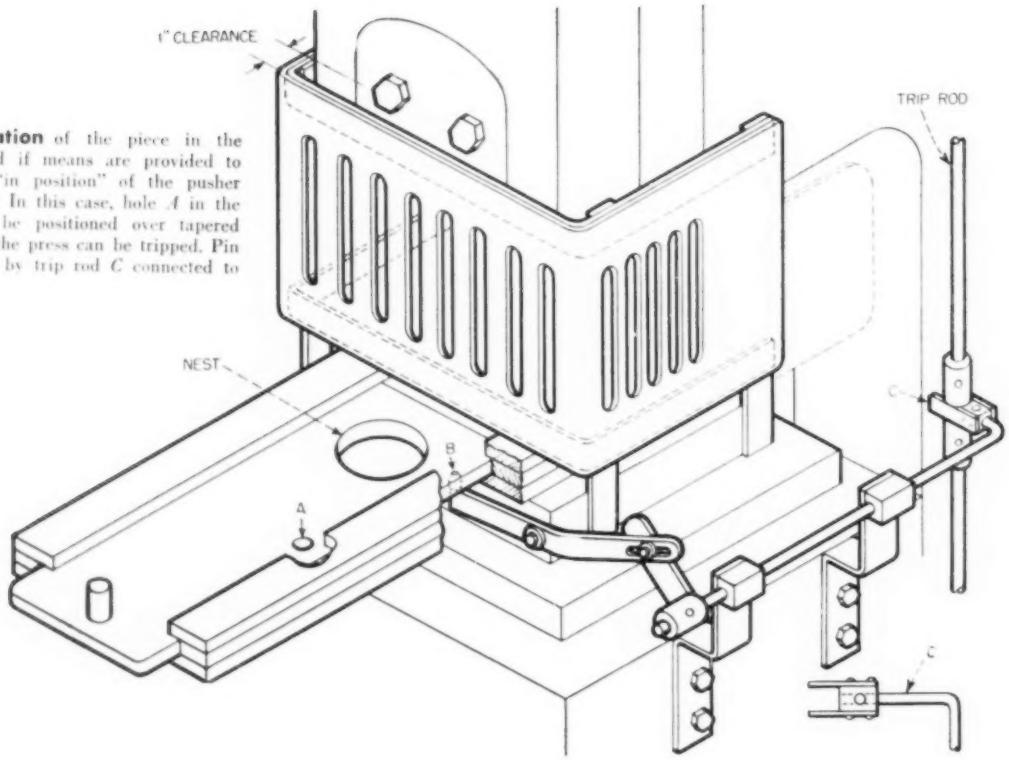




FINISHED PART

A follow feed with a side holding pad is used when the shape of the part is such that it will not slide by gravity. Each piece that is fed pushes a formed part from the die. Holding pad *B* is pushed down by stud *A*, so there is clearance for the part in bending. Finished part pushes through to the back of the press. A barrier inclosure should be provided for complete protection of the operator

Proper location of the piece in the die is assured if means are provided to register the "in position" of the pusher nest correctly. In this case, hole *A* in the pusher must be positioned over tapered pin *B* before the press can be tripped. Pin *B* is actuated by trip rod *C* connected to the clutch



Mechanized feeding arrangements provide more operator safety

Guarding arrangements attached to the press are important and helpful, to improve safety for punch-press operators. The operator is, however, required to reach between the punch and die. That is why much effort has been expended to apply mechanized feeding, as by a sliding bolster, a dial or some other device to keep the operator's hands out of the danger area. Nevertheless, the degree of safety you get is measured by how much thought is applied to avoid *any* unsafe contingency, and also how much you are willing to spend for safety features.

One of the best arrangements that has been evolved is the die slide and safety control system developed by engineers at the Poughkeepsie plant of the International Business Machines Corp.

The IBM die slide has been applied to a No. 3½ V & O open-back inclinable press but is adaptable to similar presses of 35-50 tons capacity. The slide now in use will accept 50% of dies in use without alterations. Form dies can be adapted easily to the die-slide system. Plans are underway to build a larger slide for a 100-ton press.

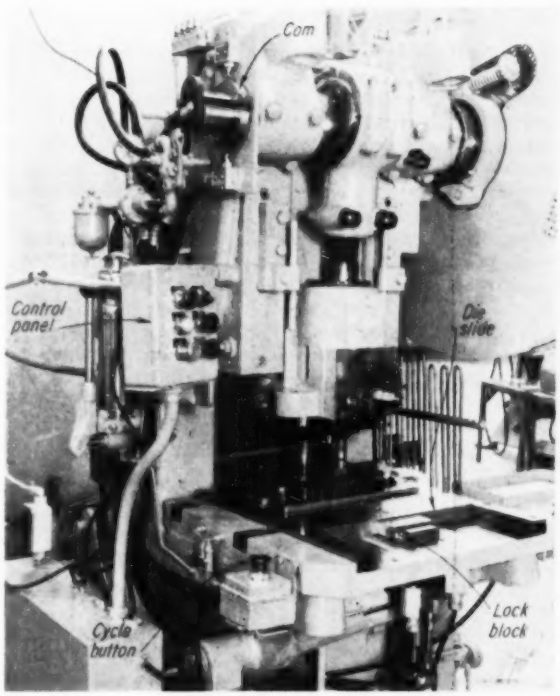
IBM engineers say this about the die slide:

1. The system satisfies the objective of safe punch press operation by eliminating any need for the operator to place his hands under the punch, and at the same time it provides better working conditions.

2. The proposed system can be built and installed for a moderate cost per press.

3. The wide usage of die sizes on the slide overcomes the disadvantage of any slight decrease in number of pieces produced per hour.

4. For more positive control of single-stroke cycling of the press, an air clutch will replace the dog clutch in the future, whenever a die-slide system is installed. This change will eliminate the possibility of press repeat because of excessive wear of the dog.



Die slide designed by IBM engineers moves lower half of die set out toward operator to load part, then inward against stop blocks for second-operation work. Cam on crankshaft trips microswitches that control clutch and the movements of the die slide and its lock block. Operator must push both cycle buttons to start cycle. Diesetter must put one hand on cycle button and the other on jog button to jog the press. Setup, of moderate cost, indicates a well-thought-out safety program planned to forestall injury from any conceivable operator mistake or equipment failure

Construction Features

The die slide is a movable section of a newly designed bolster plate. Movement of the slide is obtained by means of an air cylinder mounted between and behind the press uprights. Piston stroke is 6 in., to push the slide out to the loading position and then to pull it back to the operative position. Two stop blocks on the back of the bolster plate position the die slide and the lower half of the die set under the ram. Protruding from the left-hand block is a Microswitch set at 0.005 in. If the die slide does not come into contact with the Microswitch, the machine will not complete its cycle. In other words, the die slide and the lower half of the die must be properly located before the ram will descend.

An air-controlled locking block for the die slide works in conjunction with the stop blocks and Microswitch. This locking block moves up into contact with the die slide. It recedes into the bolster plate after the punch cycle is completed and the die slide is ready to move toward the operator for reloading.

Crank Controls

Two cam-operated Microswitches control operation of the ram. The top switch, riding on the cam, tells the machine when the ram is at top dead center, ready to operate. When tripped, the switch completes the control circuit and sets the ram in motion. Likewise, when the lower switch is tripped by the cam, a circuit is completed to cause the ram to return to the up position and the die slide to move outward to the operator.

Control Buttons

A control panel at the left of the press includes "jog" and "reset" buttons. The jog button will not respond unless the operator or diesetter keeps his hand on the left-hand cycle button mounted on the bolster plate. Thus, the man is unable to work in the danger zone, while the machine is being jogged, as for set-up purposes.

The reset button retracts the die slide to the loading position if the operator wishes to remove a part that is not nested properly in the die or has fallen out.

Once set up and ready to operate, the two cycle-control buttons at the left and right of the bolster must be depressed *together* to put the press into a cycle. Thus, the operator's hands cannot be in the danger zone, when the die slide moves into position and the ram starts to descend.

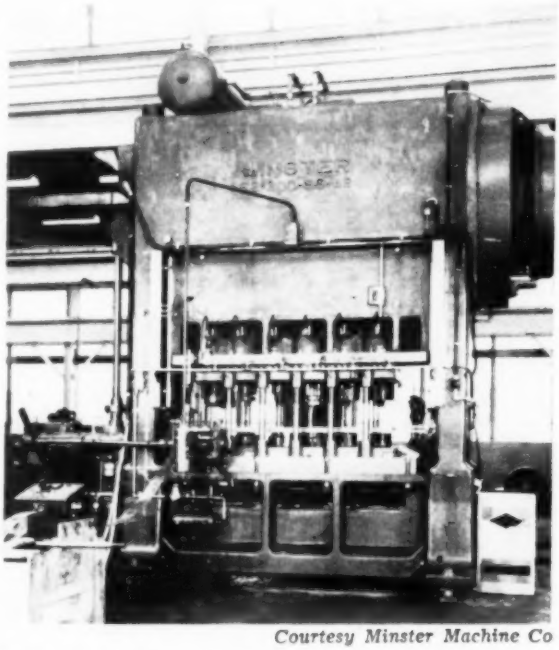
SAFER SETUPS for your press department . . .

Automated and automatic presses reduce accident exposures

Automated press lines are generally much safer than a line of manually fed presses. But one cannot be lulled into a false sense of security. Many exposures to accidents have been eliminated but others may have been created or overlooked. Pinch points can exist with coil feeds, and recoilers, just as with a punch or stripper. Electrical hazards may have been introduced. Guards may be required around swinging arms or loading devices. Jams may develop in loaders and unloaders, and workers may be hurt trying to remove the cause of the trouble. Appropriate guards and lock-out controls should be applied.

A transfer type of press eliminates many accident exposures that would be present if the part is processed over separate dies. In the example illustrated, the exposures eliminated include one on the primary operation and several very hazardous ones on the secondary operations. No under-the-punch feeding is required and likewise no scrap handling.

Coil stock is fed from the front with a roll feed. The part is blanked free of the coil, partially drawn in the first die stage and the scrap is chopped. On press upstroke, a rotary camshaft ejects part from die cavity to level of transfer device. Transfer fingers grip part as stroke continues, and transfer bar moves part from left to right to next station in die. Transfer fingers release the part into new die station and bar moves back to original position as part is automatically positioned. At last die station, part is automatically ejected from the press to storage container, conveyor or other materials handling unit.



Courtesy Minster Machine Co

Transfer-type press produces a part automatically and eliminates the accident exposures present with a non-automated press line. Safety of operator and die setter are greatly increased by the air-friction clutch

Avoids Several Hazards

Many safety features are included in the machine design. Automatic recirculating oil lubrication of bearing surfaces with safety pressure switches assures proper lubrication, or else the press is stopped. This press is equipped with an air friction clutch. Formerly in mechanical presses, the positive-action mechanical clutch had to be on the crankshaft to keep engagement velocities at a minimum. Broken crankshafts and gears were common, even on small presses, which presented a hazardous rigging and service problem and, also, the never-ending possibility of press repeat.

Operator safety is greatly increased by being able to control the clutch. One of the major safety features of air friction clutches over mechanical positive clutches is that they may be engaged at any point in the press cycle—not just at one point or a few points in the rotation of the crankshaft. They may be disengaged and the brake applied at any point in the press cycle.

The operator can stop the press on the down stroke when he realizes that a piece is improperly nested or that two pieces are in a die. Such action could prevent die or machine damage and resulting service or maintenance problems. Strange as it may seem, many punch press accidents are a result of the instinct-of-retrieve or tendency to automatically reach into the die to correct an error. The provision of a stop button and air friction clutch minimizes this possibility, because the operator can hit the button and the slide will stop prior to personal injury or die damage. Another important item involving increased operator, tool and press protection in regard to air friction clutches, is the use of sensing devices, limit switches, etc. These can be designed to stop the press regardless of position of slide in the cycle, in case of jams and misfeeds.

The author wishes to thank Paul E Pedersen for his help in compiling and preparing the manuscript.

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How to accomplish more with less work

By Jack E Bedford, Professor of Management, Armstrong College

Top management men who keep their work up to date follow a simple formula. It keeps their schedule current and is flexible enough to prevent unexpected situations from disrupting their routine.

Successful executives have followed this plan for a long time. It is an old, time-tested technique of management. The formula has these three parts:

- Refer
- Defer
- Delete

Each of these steps is important to the decision-making process. The successful executive applies one of the steps to almost every decision he makes.

Step One: Refer

When an executive refers a duty to someone else in the organization, it can be a time saver for everyone. This referral can be done to avoid a time-wasting task, to bring special skills and abilities into the picture, or to train another man to take on new responsibilities.

Suppose that a top executive is asked to give a speech. The invitation is an honor and is good public relations for the firm. It cannot be deferred or deleted.

Some executives will spend a day, two days, or a week in writing the speech. It will be good. But in twenty minutes or a half hour it is over. The time and dollar cost of this executive task may be tremendous. And during this speech-writing time many more important tasks and decisions may have been deferred.

The executive who follows the management formula will refer this speech-writing to someone else: the public-relations department, the advertising department, or a ghost writer who works on a fee basis. By referring the job to someone else, the executive has a day, two days, or a week that can be devoted to top-level management decisions that will build profits for the company.

It is often wise to refer tasks to subordinates who need executive development. If a production schedule or sales budget is needed, the top executive—better prepared for the job than anyone else in the firm—may refer the task to one of his assistants. When he does this, he is providing executive development. The person assigned the job grows in management stature. He learns how to prepare the schedule or budget. He gains self-confidence, and his loyalty increases many times.

A maxim of successful management is that when two partners always agree, one is unnecessary. This is another time when referral may be the best management strategy. Some executives follow the practice of always referring important decisions to someone else. This provides another viewpoint and helps make the final decision better.

Step Two: Defer

Successful executives do not put off until tomorrow tasks that need to be done today. Yet on every executive's daily schedule there are items that do not have a deadline. These are the items that can be deferred to provide more time for the "must" items and special situations that might develop during the day.

For instance, many of these tasks are in the "when I have time" category. A sales budget, due the first of December, might be on an executive's schedule in October. He thinks about it, but because there isn't much urgency puts off actually doing it.

This is not what is meant by defer. Each day a task is deferred this way it takes up a certain amount of the time that the executive needs for concentration. A better way of handling this is to defer it to some specific date in advance of the first of December deadline.

Another time when executives can use the "defer" phase of the management formula is when there is not enough time to complete the job. Some tasks require so much time that there is not enough time to complete them and still handle other urgent work. It is best to defer these, if possible, to a later date when there will be plenty of uninterrupted time to complete the job. Don't "put it off." Transfer it to some better time.

Step Three: Delete

Every executive has some things on his daily schedule that are not necessary. Some are tasks that have changed in importance since they were entered on the program. Others are things that have been done or handled by someone else in the firm.

Minor and unimportant things on a daily schedule got there for some reason. A quick review of the reasons why they are there and what recent developments have been will indicate what items to delete.

In one instance a management consultant discovered that one executive was always loaded down with work. His office secretary wrote more letters than any other in the firm. Yet this executive always had some odds and ends of unfinished business at the end of the day.

Analysis revealed that this executive personally answered all letters addressed to him. Even direct-mail advertising got an answer, with his name filled in on a form letter. When "file thirteen" was used to delete these irrelevant and unimportant these unimportant letters this executive's efficiency increased.

Fifteen minutes spent in an analysis of the daily work schedule and the application of the REFER—DEFER—DELETE formula will be a quarter-hour well spent. It can help to reduce the executive's calendar to a reasonable day's work. It is a plan that can be put into effect in a minimum of time and with professional results.

3 new reports on ceramic tools

Cemented-oxide (ceramic) tools have now been proved practical and highly efficient for many metal-cutting operations. These three reports show that in many cases they do better than more conventional tool materials.

1 Oxide turning and belt grinding improve a grinder job

By Robert T Hook, Chief metallurgist, Warner & Swasey Co, Cleveland

Bonded abrasive wheels may soon run into new and unexpected competition from ceramic tools. According to test runs on hydraulic piston rods at Warner & Swasey's New Philadelphia, O, plant, the combination of turning with oxide tools and polishing with abrasive belts can produce as good results at less cost on some jobs.

Tests were made on piston rods for Gradall earthmoving machines; C-1118 hot-rolled steel bars with a critical section 19¼ in. long and with a 2.996-2.998-in. dia. These center sections of the piston rods must be precisely machined before 0.0005-in. hard-chromed plate is applied to resist wear and corrosion as the rod moves inside a hydraulic-cylinder packing gland.

Standard method for the rods was to rough-turn the section to 3.018-3.023 in. with carbides, then rough and finish grind to the final dimension. Finish had to be at least 20 mu in. But the clean, smooth surfaces produced by ceramic tools on steel parts during W & S machinability tests some time ago indicated that part of this grinding work might be eliminated if ceramic tools were applied. Calculations showed that cost of the part could be reduced $1 by the change.

New Method

Ceramic tools were added to the front-carriage turret of a W & S No. 2A turret lathe to test this theory on production parts. Carbides were still applied for roughing cuts to bring the stock down to 3.035-3.040 in. Then semifinishing cuts were made with the ceramic (cemented-

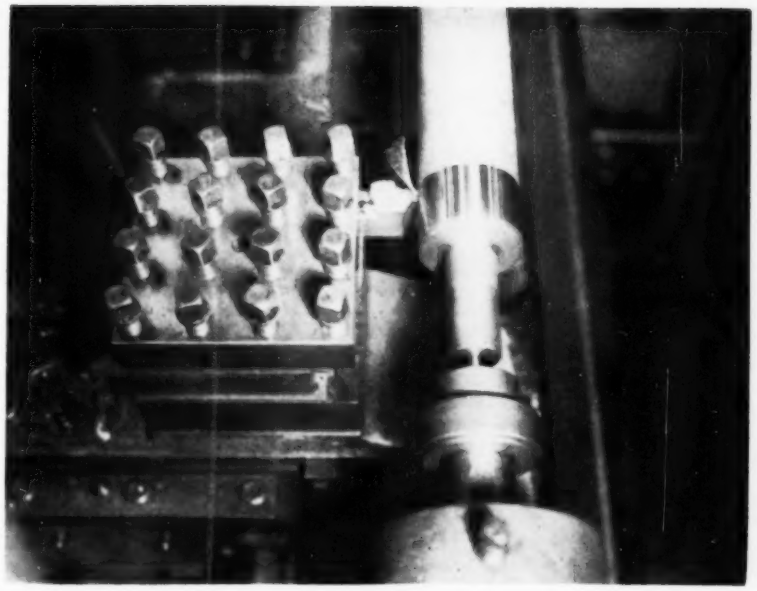
Finish Turning With Ceramic Bits Produces Easily-Polished Surfaces

		Semifinishing			Finishing (Ceramic tool only)			
Part	Tool Material	Speed SFPM	Feed IPR	Finish Mu-In.	Feed IPR	Finish Mu-In.	Taper in 19"	Finish After Buffing Mu-In.
1		880	0.004	50-75	0.006	48-55		12-15
2		880	0.008	48-50	0.015	8-10		10-15
3	Ceramic	880	0.011	42-45	0.015			10-15
4		880	0.015	90-95	0.015			12-15
5		880	0.020	100-135	0.015	110-120		10-60
6		450	0.060		0.011	70-75	0.0005	
7	Carbide	450	0.060		0.011	95-100	0.0015	
8		450	0.060		0.011	60-65	0.000	
9		360	0.023		0.011	110-120	0.000	
10		360	0.023		0.011	100-110	0.002	
11		360	0.023		0.004	65	0.002	
12	Carbide	360	0.023		0.004	45	0.000	
13		360	0.023		0.011	85-90	0.001	
14		360	0.023		0.011	Very Rough	0.003	
						100-110	0.000	

Oxide turning and belt finishing . . . proved practical and efficient. Best result was with oxide semifinishing and finishing cuts that produced 48-55 mu in. Tools were indexed after showing signs of edge wear. Chatter showed up during cut No. 9; work was oversize, tool indexed, and a second cut taken at No. 12; a second cut at No. 14 cleaned off the rough finish after the tool was indexed

oxide) tools to see what results were possible. Fourteen tests were made:

- Five shafts were semifinished with a ⅜-in. IC 3/16-in.-thick triangular oxide bit clamped in a Stupalox TAMR-1 holder. This supported the bit at –5° back and side rake and produced a 45° lead angle. Speed was 880 sfpm, and depth of cut was 0.014 in. Feed rates were increased from 0.004 to 0.020 ipr (Tests 1-5).
- Three shafts were semifinished with a square throwaway carbide bit (Tests 6-8, see table). Corners of the bit were ground to Russian geometry (AM—April 12'54, p171), in which a short length of the cutting edge is ground parallel to the work axis. This usually permits higher feed rates than with conventional grinds. Speed was 450 sfpm, feed was 0.06 ipr, depth of cut was 0.014 in., and rake angles were both –5°.
- Six shafts were semifinished with throwaway Kennametal K4H and Carboloy 370 bits, ½ in. square and 3/16 in. thick, clamped in a Kennametal SBR-86A holder. Cutting speed was 456 sfpm, feed was 0.023 ipr, depth of cut was 0.014 in., and rake angles were also both –5°.

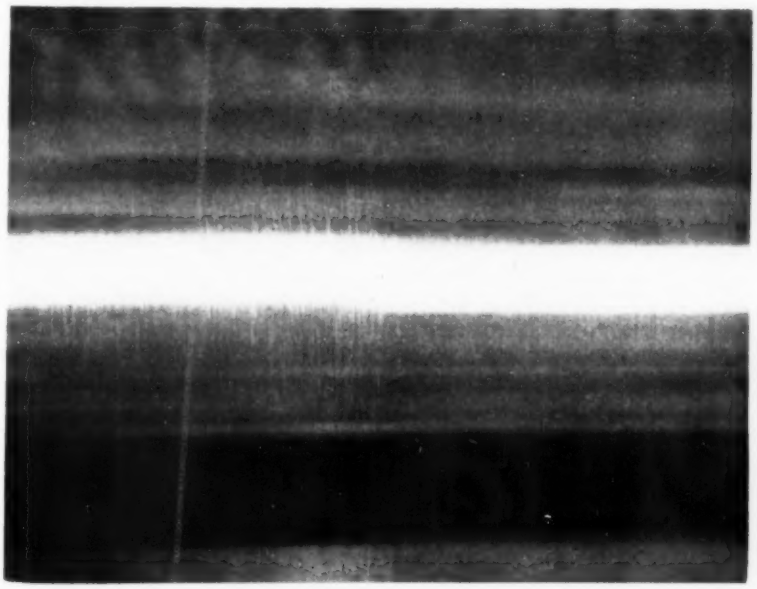


Test bar was machined . . .
on a turret lathe by a ceramic (cemented-oxide) tool. Tightly curled chip and high finish on work indicate good cutting conditions

Ceramics for Finishing

All shafts were finished with ceramic bits clamped in the same holder applied for the first five semifinishing cuts. Speed in all cases was 880 sfpm, and depth of cut was 0.007 in. Best results were with a feed rate of 0.006 ipr, which produced 48-55 mu in. This might be considered rough for a final polishing cut, but it resulted in minimum polishing time with coated abrasive belts.

The piston rods were polished at a conventional backstand grinder by one pass with a 240-grit belt and a second pass with a 400-grit belt. Rods were mounted between centers in a hoist-supported welded frame that was positioned and rotated manually for these tests. This rough setup will be replaced when suitable equipment can be installed.



Improvement of surface finish . . .
showed up after abrasive-belt polishing. Area at left was ceramic-turned to 48-90 mu in.; area at right was polished to 10-15 mu in.

Savings

Data collected during the tests showed that 0.132 hr could be saved per part—not a large saving for the 600 parts produced annually, but an indication that many similar parts could also be finished similarly to justify the change in method.

Results of these tests and others made with cemented oxides indicate that the finish depends on the ability of the tool material to resist wear and on the geometry of the cutting edges. But much more work must be done in the field before results can be predicted for a given set of conditions.

In addition to many future possibilities where oxide turning and belt polishing may replace conventional turning and grinding, oxides may well prove successful on materials that have so far resisted cutting by any other known tool material—for example, oxides are being successfully applied for turning and boring steels of 40-55 R_c hardness. Ceramic, or cemented-oxide, tools should be considered for more than just high-speed turning—their first dramatic success—and should be tested for many other applications.

3 new reports on ceramic tools...

2 Oxides thread hardened steel shafts

By Edward Meier, tool engineer, tool & mfg div, A O Smith Corp, Milwaukee

Ceramic tools can cut clean, smooth threads in hardened steel if speeds and feeds are slow and if impact is minimum when the tools enter and leave the work. This was proved recently when tests were aimed to find out more about cutting-edge shapes and cutting conditions for ceramic (cemented-oxide) tools on different materials and operations.

Test parts were forged AISI 4140 bars, on which straight sections were first turned 24 in. long and 4½ in. in dia. Tools were ⅜-in. triangular Stupalox or Vascaloy-Ramet VR-97 bits with 1/32-in. corner radii, held in a VR TDTR-16 right-hand holder equipped with a chipbreaker plate. The bits were held at –7° rake and 30° lead angle. Best tool life was found at about 160 sfpm, 0.007 ipr feed, and 0.010 to 0.060 in. depth of cut. Finish ranged from "fair" to "good." No cutting fluid was applied.

Threading tests were also made on 4140 bars, some of which were as large in diameter as 5¾ in., and which were hardened to 55 R_c. Relatively slow speeds and feeds produced best results.

Chasing

Then threading tests were made with a VR-97 bit equipped with 0.008-in. corner radii, held in the same clamping holder but with the rear face of the clamp head ground back from the normal 40° to 60° to insure work clearance. The compound rest was set at 30°, which allowed it to be advanced into the work so the tool would only cut on one side.

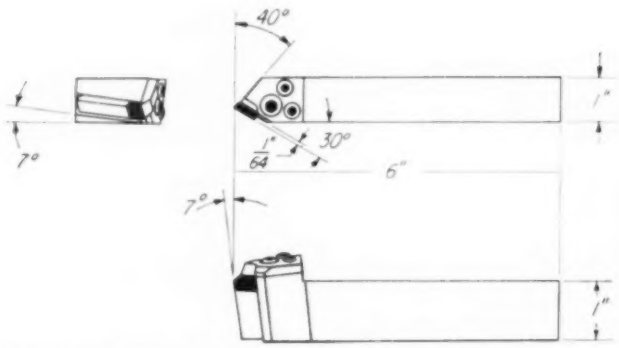
Chasing passes were taken at approximately 182 sfpm with a depth of cut of 0.010-0.005 in. per pass, decreasing as the threads approached full depth. An 8-tpi thread was cut about 3½ in. long, with the tool passing from the thread into a previously cut clearance groove. Then a 16-tpi thread was cut about 2⅛ in. long the same way.

Results

In both cases the threads were smooth and clean, but because of fairly sharp chamfers at the ends, some cutting-edge chipping was encountered. With shallower chamfers this difficulty should be eliminated. Pressure against the tool should be released gradually.

Finally, for comparison, a 3¾-in. section was threaded with a VR Grade E carbide tool of the same dimensions and held in the same holder, at the same speeds and feeds. No chipping was encountered, possibly because the chamfers were at 30°; but edge wear on the bit was slightly greater than with the oxide tool.

It is our belief that our success in chasing the threads shown helps broaden possibilities for using cemented oxide tool bits as we learn more about the correct cutting-edge shapes and cutting conditions for different materials and operations.



Clamping holder positioned oxide and carbide tools . . . for comparative threading tests. Side clearance angle was changed from 40° to 60° after turning was finished and before thread chasing started

Test bar was threaded . . . at 182 sfpm, with ceramic tool making first two threads and a carbide cutting the third (nearest in photo). Carbide tool wore more; ceramic was more sensitive to impact

3 Oxide boring beats internal grinding

By Lydel Manor, superintendent, lathe dept, Kearney & Trecker Corp, Milwaukee

Faster production and lower tool cost were the results when hardened steel gear blanks were bored with ceramic (cemented-oxide) tools in place of conventional internal-grinding operations.

These tests were made on two parts: rough-machined, hardened, and shot-blasted steel blanks, and rough-machined hard cast bronze blanks of the same size. The bores were 3 in. long and 3¾ in. across. Tools were ⅜-in. Stupalox bits with 3/32-in. nose radii, clamped in a 1¾-in. boring bar designed to hold throwaway carbide bits at –4° radial rake and 0 lead angle.

Finish boring was done with one in-out pass of the tool, using 1400 sfpm and 0.005 ipr for the steel blanks, and 1700 sfpm and 0.002 for the bronze. Depth of cut was 0.005 in. Each toolbit corner was used for 1 hr during the tests, which included only finish boring.

Parts of SAE 4150 (hardened to 210 Bhn) wore the tool edge only 0.000,350 in. in an hour; parts of SAE 4615 (hardened to 250 Bhn) wore the edge slightly more; but SAE 64 bronze produced negligible wear on the tool.

Boring tools were triangular . . .
⅜ in. across an included circle, and 3/16 in. thick. Corner radii were 3/32 in. Work was gear blanks finished by usual methods except for the in-out boring pass

Fluid sealants simplify shop joining

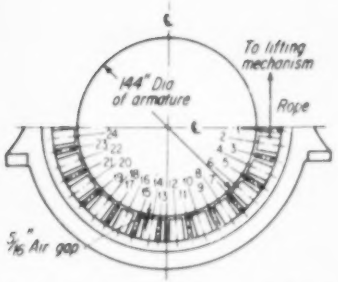
Loose roller bearings on the axles of switching locomotives once cost $500 to overhaul. Now, a dollar's worth of liquid sealant solves the problem. The sealant is simply dropped into the clearance caused by wear and allowed to set. It locks the bearing to the axle. If bearings are excessively loose when they reach the service shop, a sleeve of shim stock is coated on each side with sealant and slipped into the space.

Another company is testing the use of a sealant instead of a press fit to fasten bearings on axles for large two-trailer trucks. With simplified machining and easier assembly, trucks have recorded nine months of satisfactory service on Rocky Mountain hauls.

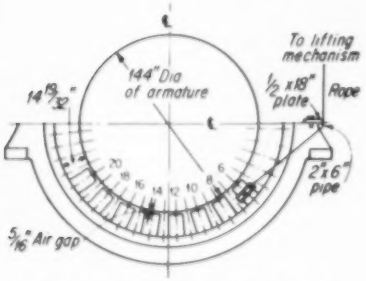
The foregoing are only two of the many unusual applications for fluid sealants reported by users of Loctite, manufactured by the American Sealants Co, Hartford, Conn. Avoiding the need for interference fits on bearings, sleeves, shafts and studs, this material is a heat and oil resistant plastic which hardens in the absence of air into a bond which will withstand a torque of up to 1000 lb or more.

Other uses for this sealant include locking adjustment screws on the armatures of thermostat relays, sealing No. 4 screws in engine-hour meters (sealant was applied by tumbling and freed three people to save $12,000 per year), compound mixed with iron dust to lock a setscrew in a vibrating mechanism that formerly had to be tack welded, replacing a neoprene O-ring to seal silicone oil in the cast-aluminum housing of a galvanometer, and sealing porous castings.

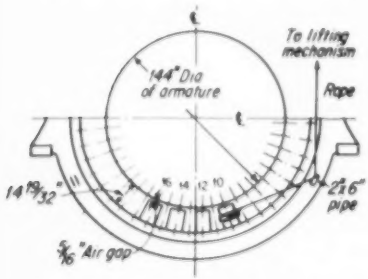
One company reported that it had the problem of fastening hardened sleeves for shrink fitting them on paper-making machinery. Shafts are 4 to 6 in. dia and sleeves are 10 in. long. Heat used to expand the slevees for shrink fitting them on the shafts also took the temper out of them, hence the company was forced to use hardened stainless-steel sleeves at 10 times the cost. By using the liquid sealant, sleeves having a clearance fit can be used and, because no heat is necessary, the hardened steel can be used instead of the stainless, which reduces machining material costs.



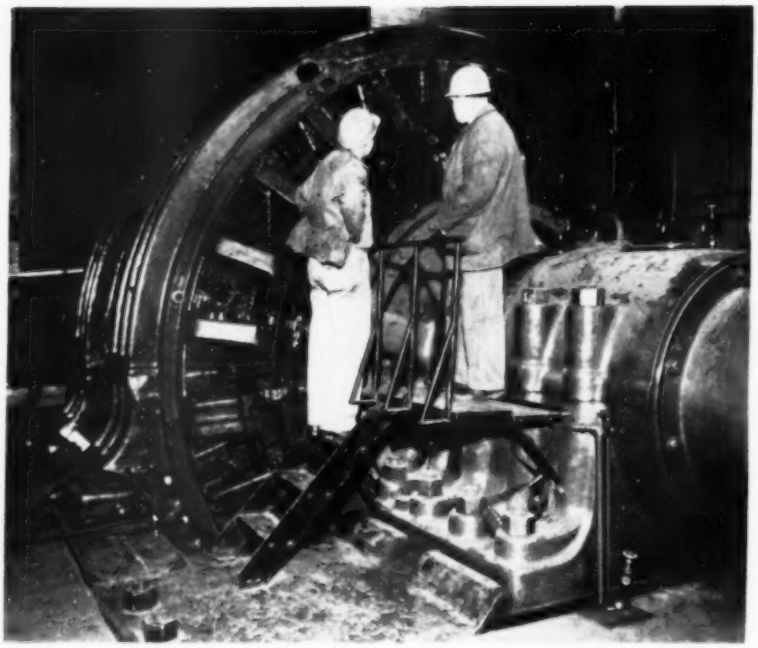
Step 1 – Remove interpole coil No. 1 with chain fall. Remove all other interpoles by sliding each one out across the field frame, then raising it with the chain fall when clear. (These interpoles can be removed all at once or after each succeeding shunt field is removed.) Removing interpoles allows clearance to place a clamp around each shunt field coil. Remove shunt field coils No. 2, 4, 22, 24 by lifting straight out with chain fall. Take coils No. 2 and 4 out on right; coils No. 22 and 24 out on left, facing commutator



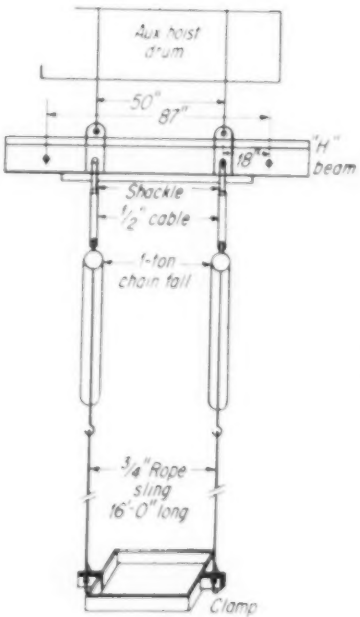
Step 2 – Remove shunt field coils No. 6, 8, 18, and 20 by placing rope sling around the clamp, the 2-in.-dia pipe roller, and attaching the rope to the chain fall. Raise the coil until it begins to bind. Block coil so it can't slip back down frame, remove 2-in.-dia pipe. Pull coils straight out with chain fall. Remove coils No. 6 and 8 on right; coils No. 22 and 24 on left



Step 3 – For coils No. 10, 12, 14, and 16, follow Step No. 2, except pipe is placed in motor-frame hole for first pull, then when coil begins to bind pipe is placed under plate and procedure is the same as Step No. 2



Rebuilding a 7000 hp motor *— in place!*



Lifting Mechanism

Last year's somewhat slackened business pace gave many companies a maintenance opportunity they haven't had since the late 30's. Great numbers of these firms used this breather to get set for the even greater demands expected in the 60's. Among them the steel companies, some of which had been working at full steam since before WW II, placed special emphasis on rebuilding heavy equipment.

At Bethlehem Steel Company's Lackawanna, NY mill, for example, there is a 7000 hp double-armature motor used on a 40-in. blooming mill. Installed by Westinghouse in 1924, the mill operated almost continuously until 1950 and in that 26-yr period rolled 13,922,054 tons of steel.

Actually, this motor consists of two 3500 hp motors in tandem on a "double armature" which operate at 50 to 120 rpm. Power is supplied at 700 volts. In 1950 the motor was torn down to replace the armature. In 1957 the armature was replaced

again. But at both times the demand on the mill was too great to permit the downtime needed for a complete overhaul. Thus, the bottom-half stator fields, in the motor since 1924, needed to be replaced.

If you think you have materials-handling problems, picture this: The armature weighs 100 tons; each coil weighs one ton. There are 12 stator coils in each of the two bottom halves. The air gap between the stator coils and the rotor is 5/16 in.

Step One was to decide whether to remove the armature from the frame to simplify removing the coils. Experts said it had to be removed. After considerable study, T O Zittel, superintendent of the Electrical Department, and his aids, C L Squier, assistant superintendent and J F Oehler, assistant to the supt, decided to leave the armature in place.

In the first place, removing the armature would take 36 hr by itself; even more important were the problems of lifting the 100 tons, blocking to support the armature after its removal, and the work necessary to disconnect the Kennedy coupling and to remove the bearing caps and bearings. And then the armature would have to be replaced with great care.

Develop special lifter

Against these problems were the more exacting tasks of removing fields with close clearances and unsoldering, or even bringing heat near, the armature coils. By developing the lifting device shown, plus carefully planning removal of the coils as shown in steps 1, 2, and 3, these men succeeded in record time. Asbestos sheeting plus Johns-Manville No. 55 fireproofing tape protected the armature coils against heat damage. For each coil it was necessary to unsolder, remove bolts and shims, and then slide it out.

Arrangements were made with Westinghouse to send all of the field coils and interpoles to its service shop for overhaul. Within 10 days the job was completed—from removing the coils to overhauling and replacing them and reconnecting the shunt fields in parallel for a new variable voltage control.

During the same period the electrical construction men removed all of the original control panels and installed a new variable voltage control using Westinghouse Rototrol and Magamp systems. The supplier's men checked the control circuit. With all tests completed satisfactorily, this giant mill resumed rolling just 15 days and 8 hr after it had stopped.

Coolant system key to better gundrilling

With a rapidly growing number of firms making use of gundrilling in many different phases of production, coolant systems are found to be among the more critical factors in effectively using the process. Engineers at Eldorado Tool & Manufacturing Corp, Milford, Conn, designers and manufacturers of deep-hole drills and tube reamers, offer these suggestions:

To have efficient gundrilling, two considerations are primary. The proper cutting oil must be used and the machine must include an efficient high-pressure system, plus proper filtering, to get the oil to the work-gundrill interface.

Special cutting oils for gundrilling now are available from a number of suppliers. In general the oil must provide penetration, superior lubrication, high film strength, free flow, and good heat-removal properties.

With the proper oil selected, the system of oil delivery must be considered. Basically, this system consists of the pump capable of delivering cutting oil to the drill at suitable pressures, a high-pressure gage, a pressure regulator, provision for chip drainage, and a sump or reservoir. The system also may include a drain pump to return oil to the reservoir through a filter. For setups where the drill is turned, a rotary gland or fluid transfer is necessary.

Two basic designs of pumps are variable-volume control and fixed-volume control. For either pump, the system required to deliver oil is fairly large compared with conventional drilling machine systems or with the usual sort of coolant pump for cutting operations. A typical pump for a ½-in.-dia drill might be capable of 600 psi at 10 gpm and require a motor of from 5 to 6 hp. Smaller drills require higher pressure and less volume while larger drills use less pressure and greater flow.

Various designs of rotary and piston pumps can be used, but care should be taken to select a pump that will have a reasonable life. Bear in mind that oil viscosities at operating temperatures can be as low as 50 SUS. Very fine suspended chip particles may then enter the pump.

Chip separation and draining present few problems. Methods used in other high-production set-ups are applicable. Volume of chips is fairly large because of the thin chip formed, hence provision for chip drainage to reduce coolant carry-off is essential. Fine particles will be formed, particularly when drilling brittle materials such as cast iron and titanium. These particles down to the size of about five microns, should be removed by filtering or by centrifugal or magnetic separators.

A rotary gland or fluid transfer is particularly important at speeds up to 10,000 rpm where coolant pressures rise to 1500 psi. There are basically three coolant transfers:

1. Front-of-Spindle Controlled-Leak Design, though simplest, is not necessarily best. It has a non-rotating collar through which the oil is introduced into the piece. It is impossible to seal this gland and considerable oil is lost through the free-running clearances.

2. Front-of-Spindle Non-Leak Transfer units may take up valuable fixturing space, but can be mounted on a small-diameter spindle which has no hole through it.

3. Back-of-Spindle Non-Leak Transfers receive their lubrication partly from the high-viscosity cutting oils. Several styles are on the market, adaptable to gundrilling. These glands have very little, if any leakage and can be mounted outside the splash guards. Some leakage is permissible if confined inside the splash guards and if it is small in volume.

For high-production drilling where the tool rotates, it may be well to use a replaceable splash guard which can be easily removed. This should contain the high-velocity oil returning from the flute together with the chips and deflect them in the direction of the chip pan. The splash guard can be constructed as a separate unit between the spindle and the bushing plate. This leaves the fixture area open, with little splash.

Several other accessories are important for a smoothly operating coolant system. A pressure gage before the filter is useful in determining when the five-micron filter has become clogged. It is also a good idea to use a piece of flexible hose between the coolant pump and the drilling machine to avoid transmitting vibrations. An oil cooler is occasionally necessary to prevent oil temperatures from going so high that work becomes hard to handle.

Crane operators move boxes without help from shop floor

By Ray Fiorina,
chief industrial engineer,
Granite City Works, A O Smith Corp

Special overhead cranes—six of them—pick up and move loaded tote boxes in the small-parts area at A O Smith's automotive-frame plant in Granite City, Ill. Novel feature of this system is that operators can pick up and move boxes between presses and welding machines without help from the floor.

The crane operator spots his boom over a tote box, lowers and turns it to line up boom loops with hooks on the box, then engages the hooks for a pickup. At the drop point, he lowers and turns the box to spot it properly, then moves the boom away from the hooks to free the loops.

To conserve space in the 102 x 213-ft area, there are no aisles for truck movement. **The six overhead cranes, each working in a separate production bay, handle transfer of all work in progress.** Each crane has a capacity of 1½ tons.

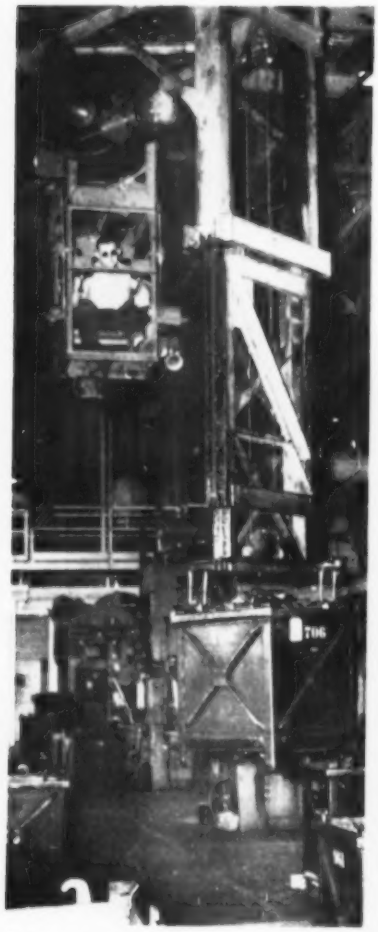
The hoisting mechanism in each crane is a vertical telescoping boom supported from a carriage (see photo). The operator can spot the boom anywhere between the supporting rails (almost 23 ft high) and can rotate it about its vertical axis 360°.

Design of the boxes, which measure 28 x 28 x 28 in. inside, permits them to be stacked vertically, set on castered floor carts, or set on the floor in their own legs (about 4 in. high). With the castered carts, a machine operator can move a boxload of parts to or from his machine from a nearby spot, while the crane in his section is operating elsewhere.

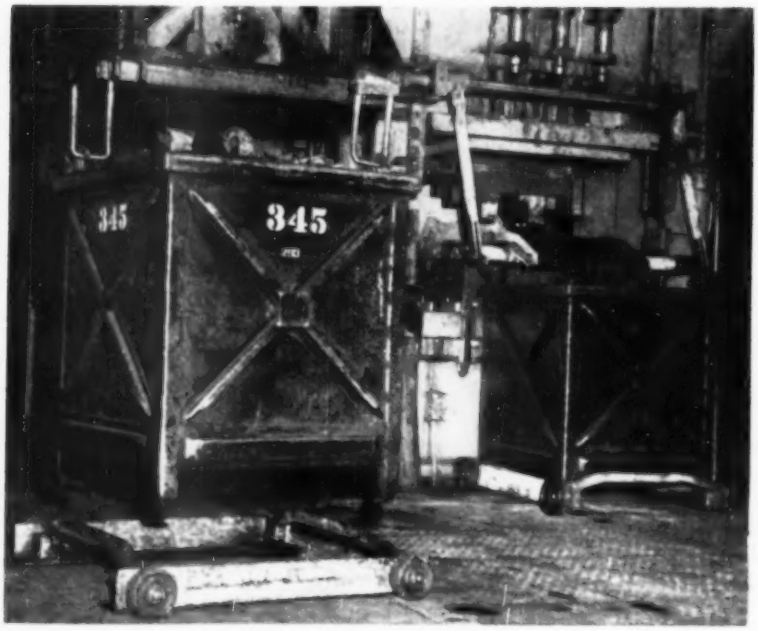
Four hooks—one at each corner—are welded to the box to receive the boom loops. The hooks at each pair of diagonal corners are turned the same way, so that the craneman can maneuver his boom easily to engage loops on the boom with the hooks.

Of particular interest is an arrangement, at each forming and bumping press, that minimizes operator fatigue. The tote boxes have loose bottom plates. Boxes of parts delivered to a press for second-forming operations are positioned by crane or castered cart over one of two vertical hydraulic cylinders. As parts are removed, the cylinders raise the bottom plate, keeping a fresh supply of parts near the top of the box.

The hydraulic lift cylinders are controlled manually with valves bolted in convenient positions on the press frames. Welded to the top end of each hydraulic piston is a steel disk (17-in. dia, 1 in. thick) that supports the loose bottom plate.



Crane operator . . .
is responsible for all movement of parts within his area, without aid from the floor. Signal lights above each press or welding machine tell the craneman when machine operator needs a new box of parts



Tote box . . .
has support legs at each corner, for standing on the floor or for centering in frame of castered floor cart. With carts, machine operators can easily move loaded boxes into or out of working positions without aid from cranes

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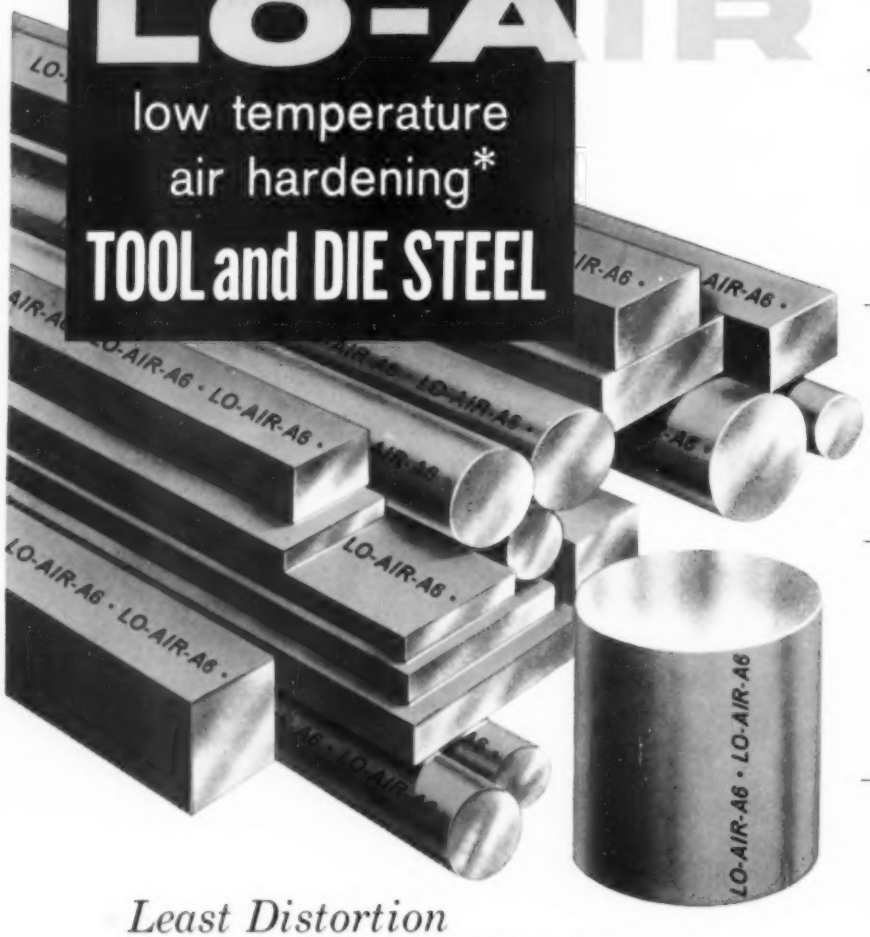

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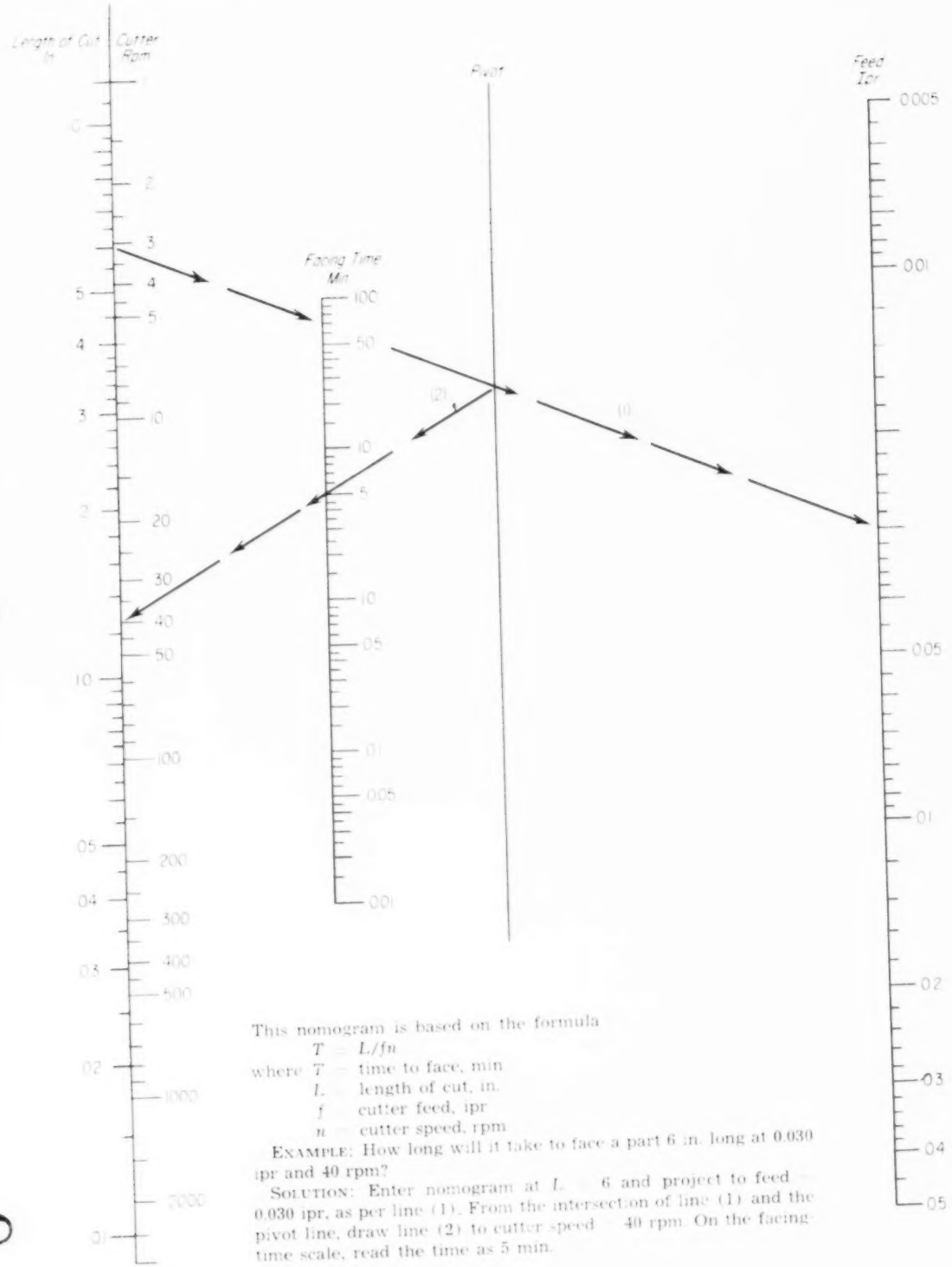
Face-Milling Time

By Tyler G Hicks, mechanical engineer



This nomogram is based on the formula

$$T = L/fn$$

where T = time to face, min
L = length of cut, in.
f = cutter feed, ipr
n = cutter speed, rpm

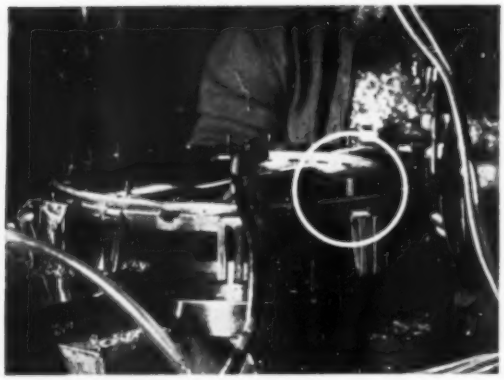
EXAMPLE: How long will it take to face a part 6 in. long at 0.030 ipr and 40 rpm?

SOLUTION: Enter nomogram at L = 6 and project to feed = 0.030 ipr, as per line (1). From the intersection of line (1) and the pivot line, draw line (2) to cutter speed = 40 rpm. On the facing-time scale, read the time as 5 min.

Practical Tooling Tips

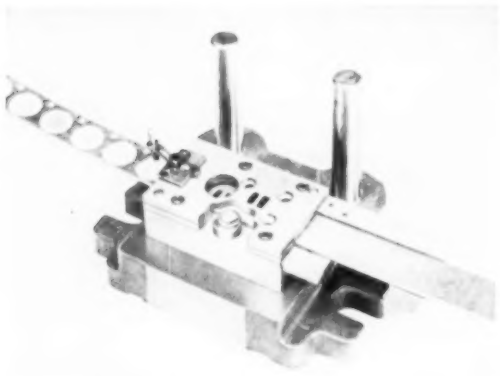
No. 3 of a series

Are your tool makers wasting time making complicated tooling gadgets when a standard, off-the-shelf Vlier part could do the job much better? Why not examine your present drawings and see where these simple, low-cost parts can be used. You will be amazed at the savings possible.

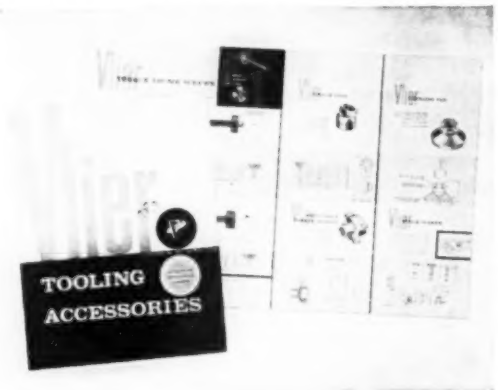


PRODUCTION INCREASED 300% when this 12-station automatic indexing and tapping fixture was put to work. Vlier Spring Plungers allow the operator to load by simply pushing the part into a slot. These simple, spring-loaded tools also position the part for the tapping operation. Available in four models; fifty sizes.

NEW SWIVEL PAD-TORQUE THUMB SCREW combines the Vlier Torque Thumb Screw and Swivel Pad Clamp. The result is a perfect holding tool—one that applies only the right amount of holding pressure without damaging the finished surface. Unique ball joint construction of the pad permits adjustment to off-angle surfaces.



PROPER STOCK ALIGNMENT IN PROGRESSIVE DIES becomes a simple task with the new Vlier Stock Pusher. Saves pilots. Mounts in tapped hole. Accommodates stock as thin as .010", width variations totalling $\frac{1}{16}$". Nothing to wear out or foul up.



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Machine Tapers—I

A proposed revision of American Standard Machine Tapers, ASA B5.10—1953 is now being distributed to industry for criticism and comment, by the American Society of Mechanical Engineers, 29 West 39th St., New York 18. The tentative standard, which is subject to revision, adds tolerances for the rates of taper. The existing standard recognizes 22 self-holding tapers selected from the Brown & Sharpe, Morse, and $\frac{3}{4}$-in. per ft. series. The same standard includes nine steep, or self-releasing, tapers based on a taper of $3\frac{1}{2}$ in. per ft.

An appendix in the proposed standard now lists all Brown & Sharpe tapers (reproduced herewith), Morse Stub tapers and Jarno tapers. Data on plug and ring gages are likewise given.

Brown & Sharpe Tapers

No. of Taper	Taper per Foot[1]	Taper per Inch[2]	Diameter of Plug at Small End[1] D	Plug Depth: *Std. B&S Taper P	Plug Depth: Diameter at Large End[2] A	Plug Depth: Std. B&S Mill. Mach. Taper P	Plug Depth: Diameter at Large End[2] A	Shank: Total Length of Shank with Tang B	Shank: Shank Length without Tang SW	Shank: Shank Depth C	Shank: Shank Projects from End of Socket X
1	0.50200	0.041833					0.23922	1 9/32		1 9/16	
2	0.50200	0.041833					0.29968	1 13/32		1 1/2	
3	0.50200	0.041833					0.37525	1 31/32		1 7/8	
4	0.50240	0.041867	0.3500	1 11/16	0.4206			2 3/16		2 3/32	
4	0.50240	0.041867	0.3500			•1 1/4	0.4023	1 3/4	1 29/64	1 21/32	3/32
5	0.50160	0.041800	0.4500	2 1/8	0.5388			2 21/32		2 9/16	
5	0.50160	0.041800	0.4500			•1 3/4	0.5232	2 9/32	1 29/32	2 5/16	3/32
6	0.50329	0.041941	0.5000	• 2 3/8	0.5996			2 31/32	2 17/32	2 7/8	3/32
7	0.50147	0.041789	0.6000	2 7/8	0.7201			3 1/2		3 13/32	
7	0.50147	0.041789	0.6000			•3	0.7254	3 5/8	3 3/32	3 17/32	3/32
8	0.50100	0.041750	0.7500	• 3 9/16	0.8987			4 1/4	3 11/16	4 1/8	1/8
9	0.50085	0.041738	0.9001	4 1/4	1.0775			5		4 7/8	
9	0.50085	0.041738	0.9001			•4	1.0671	4 3/4	4 1/8	4 5/8	1/8
10	0.51612	0.043010	1.04465	5	1.2597			5 37/32		5 23/32	
10	0.51612	0.043010	1.04465			•5 11/16	1.2893	6 17/32	5 13/16	6 16/32	1/8
11	0.50100	0.041750	1.24995	5 15/16	1.4978			6 33/32		6 21/32	
11	0.50100	0.041750	1.24995			•6 1/4	1.5318	7 19/32	6 7/8	7 15/32	1/8
12	0.49973	0.041644	1.5001	7 3/8	1.7968	•7 1/8	1.7968	8 1/16	7 1/4	7 13/16	1/8
13	0.50020	0.041683	1.75005	• 7 3/4	2.0731			8 11/16	7 7/8	8 9/16	1/8
14	0.50000	0.041666	2.0000	8 1/4	2.3438	•8 1/4	2.3438	9 9/32	8 3/8	9 5/32	1/8
15	0.50000	0.041666	2.2500	• 8 3/4	2.6146			9 33/32	8 7/8	9 31/32	1/8
16	0.50000	0.041666	2.5000	• 9 1/4	2.8854			10 5/8	9 3/8	10 1/4	1/8
17	0.50000	0.041666	2.7500	• 9 3/4	3.1563				9 7/8		1/8
18	0.50000	0.041666	3.0000	•10 1/4	3.4271				10 3/8		1/8

* These depths are not used in all cases.
† These lengths are standard for shank cutters.
‡ Taper per foot and diameter of plug at small end are basic.
§ Taper per inch and diameter at large end (Col. A) are calculated for reference. The face of the socket at the large end of the hole is the gage line. Tolerances: diameter of shank at gage line (A) is +0.002 −0.000 in.; diameter of hole at gage line, +0.000 −0.002 in.

The first three sizes are incorporated in the ASA standard for self-holding tapers.

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August 1, 1958

The American Brass Company
414 Meadow Street
Waterbury, Connecticut

Gentlemen,

SUMMARY OF ENGINEERING LABORATORY REPORT No. 8158

SUBJECT: Fatigue Life and Endurance Limit testing of; "DURAFLEX" Superfine-Grain Phosphor Bronze and Commercial Quality Phosphor Bronze, 5% (A) spring quality strip material.

SPRINGS: Flat spring strip was made into the usual type of contact springs used in switches, relays and instruments. These springs were deflected at about 1 cycle per second in a specially built fatigue testing machine and the deflections recorded.

STRESSES: The springs were deflected from the initial free position of zero stress to a final position having a bending stress of 77,000 p.s.i.

This stress, for phosphor bronze strip is unusually high and is higher than stresses ordinarily recommended for Beryllium-Copper or Stainless Steel for such severe service.

RESULTS: Commercial Quality Phosphor Bronze, 5% (A) springs acquired a permanent set quite early and broke at an average number of deflections of 453,374.

"DURAFLEX" springs were still satisfactory, showed no permanent set, no loss of load and no breakage at 4,000,000 deflections.

CONCLUSION: Design stresses for "DURAFLEX" can be at least 50% higher than the stresses for Commercial Quality Phosphor Bronze, 5% (A) as shown in the TOOL ENGINEERS HANDBOOK.

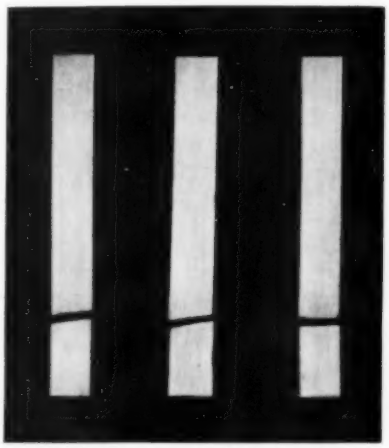
Respectfully submitted,

THE CARLSON COMPANY

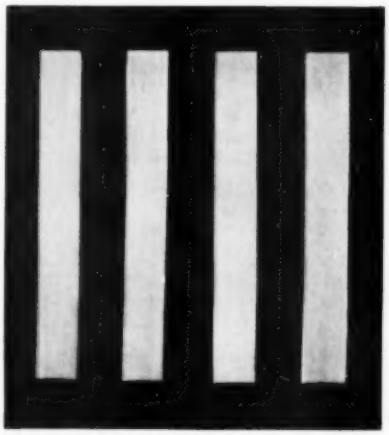
Harold Carlson

Harold C. R. Carlson, P.E.
Licensed Professional Engineer

HC:R



THREE SPRINGS of regular Phosphor Bronze, 5% (A), actual size, took a permanent set at about 200,000 deflections and fractured at an average of 453,374 deflections.



FOUR SPRINGS of Duraflex Superfine-Grain Phosphor Bronze, 5% (A) were still satisfactory after 4,000,000 deflections.

DURAFLEX, available in Phosphor Bronzes (A), (C) and (D), in strip and wire, offers a host of opportunities to cut costs while maintaining or improving quality and performance. For further information and technical help to select the alloy to meet your needs—call in your American Brass Company representative, or write: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont.

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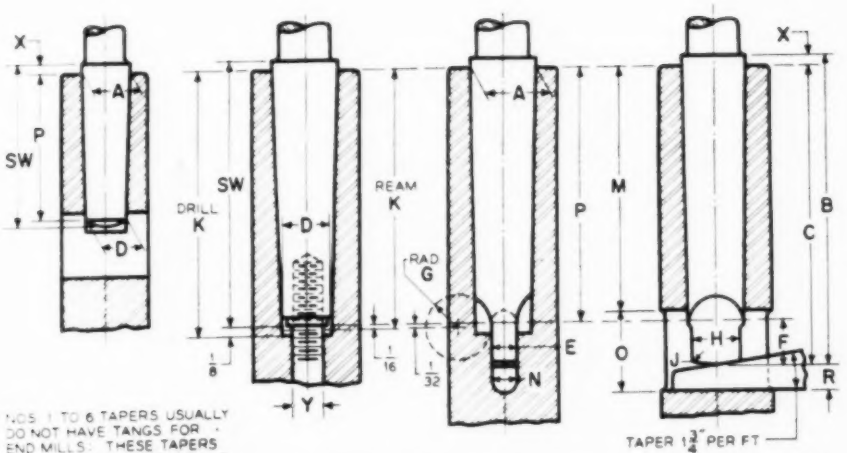
Machine Tapers—II



NOS. 1 TO 6 TAPERS USUALLY DO NOT HAVE TANGS FOR END MILLS. THESE TAPERS DO HAVE TANGS FOR DRILLS

Y – DIAMETER, NUMBER OF THREADS AND HAND, AS SPECIFIED, TO MATCH DRAW-IN BOLT (WHERE POSSIBLE, HAND OF THREAD SHOULD MATCH HAND OF CUTTER)

Brown & Sharpe Tapers (continued)

No. of Taper	Thickness	Tang				Socket			Tang Slot		
		Length	Radius of Mill	Diameter	Radius	Min Depth of Tapered Hole K		End of Socket to Tang Slot	Width	Length	Shank End to Back of Tang Slot
	E	F	G	H	J	Drilled	Reamed	M	N	O	R
1	0.125	3/16	3/16	13/64	1/32	1 1/16	1	15/16	0.141	3/8	1/8
2	0.156	1/4	3/16	7/32	1/32	1 5/16	1 1/4	1 13/64	0.172	1/2	11/64
3	0.188	5/16	3/16	9/32	3/64	1 5/8	1 9/16	1 15/32	0.203	5/8	7/32
4	7/32	11/32	5/16	0.320	0.050	1 13/16	1 3/4	1 41/64	0.228	11/16	15/64
4	7/32	11/32	5/16	0.320	0.050	1 3/8	1 5/16	1 13/64	0.228	11/16	15/64
5	1/4	3/8	5/16	0.420	0.060	2 1/4	2 3/16	2 1/16	0.260	3/4	1/4
5	1/4	3/8	5/16	0.420	0.060	1 7/8	1 13/16	1 11/16	0.260	3/4	1/4
6	9/32	7/16	5/16	0.460	0.060	2 1/2	2 7/16	2 19/64	0.291	7/8	19/64
7	5/16	15/32	3/8	0.560	0.070	3	2 15/16	2 25/32	0.322	13/16	5/16
7	5/16	15/32	3/8	0.560	0.070	3 1/8	3 1/16	2 29/32	0.322	13/16	5/16
8	11/32	1/2	3/8	0.710	0.080	3 13/16	3 5/8	3 29/64	0.353	1	21/64
9	3/8	9/16	7/16	0.860	0.100	4 3/8	4 5/16	4 1/8	0.385	1 1/8	3/8
9	3/8	9/16	7/16	0.860	0.100	4 1/8	4 1/16	3 7/8	0.385	1 1/8	3/8
10	7/16	21/32	7/16	1.010	0.110	5 1/8	5 1/16	4 27/32	0.447	1 5/16	7/16
10	7/16	21/32	7/16	1.010	0.110	5 13/16	5 3/4	5 17/32	0.447	1 5/16	7/16
11	7/16	21/32	1/2	1.210	0.130	6 1/16	6	5 25/32	0.447	1 5/16	7/16
11	7/16	21/32	1/2	1.210	0.130	6 7/8	6 13/16	6 19/32	0.447	1 5/16	7/16
12	1/2	3/4	1/2	1.460	0.150	7 1/4	7 3/16	6 15/16	0.510	1 1/2	1/2
13	1/2	3/4	5/8	1.710	0.170	7 7/8	7 13/16	7 9/32	0.510	1 1/2	1/2
14	9/16	27/32	3/4	1.960	0.190	8 5/8	8 5/16	8 1/32	0.572	1 11/16	9/16
15	9/16	27/32	7/8	2.210	0.210	8 7/8	8 13/16	8 17/32	0.572	1 11/16	9/16
16	5/8	15/16	1	2.450	0.230	9 3/8	9 5/16	9	0.635	1 7/8	5/8
17						9 7/8	9 13/16				
18						10 3/8	10 5/16				

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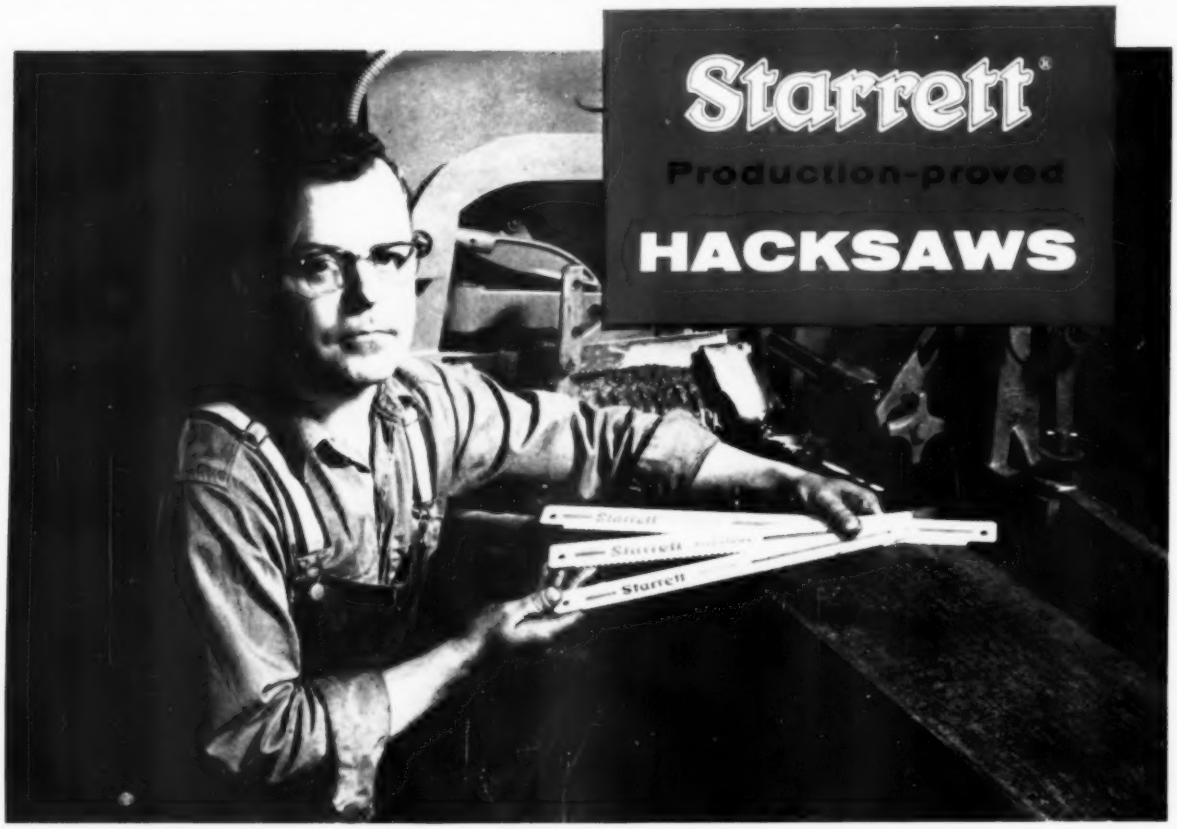

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Talking Shop...

Ever-married Women

IN THE COURSE of our search for the news we think you'll find significant, we wander down some strange byways. In a recent labor report we were studying we encountered the fascinating term "ever - married women." After some study, we discovered what these strange creatures are. They are women who are married, widowed, or divorced—hence women who were ever married. The number of working wives, incidentally, continued to go up last year, recession or no recession.

Weekend Beavers

AN AUTO ASSEMBLY plant working two shifts finds it can make sizable methods changes only on weekends. Ford Motor Co's Ford Division Assembly Plant at Mahwah, NJ, did this some time ago when a new device was built for turning over auto frames after the springs, shock absorbers, and axles had been assembled (with the frame upside down), and before the engine was mounted (with frame right side up). After a pit was dug during graveyard shifts, the unit was installed on a weekend, and it's been working ever since. It's a horizontal H, seen from the side, where frames are conveyed into one end of the H, the H is hydraulically powered to rotate 180°, and the frame is conveyed again, on its way toward engine assembly. Electrical controls and interlocks operate it automatically.

Delayed Reform

JUST BEFORE CHRISTMAS we received a notice from the Commerce & Industry Association of New York that seems to call for no comment: "The Association Workshop on ALCOHOLISM: What To Do About Detection And Control, which originally was scheduled for next Monday, December 15, at the Association offices, has been postponed to Wednesday, January 21, 1959, in order to accommodate a number of registrants with holiday season commitments that would have prevented attendance."

Winning Bid

HERE'S A STORY going the rounds of the recent SAE meeting, that we fear is probably all too true. A certain contracting agency that had best remain nameless needed a small quantity of a cylindrical part with a bore stepped in an unusual way. When the prints were sent out for bids a number of plants made bids based on special form tools to bore the inside. The lowest of these bids, each of which was based on amortizing the complex tools on a few parts, was a bit over $600 each. One small shop planned to cut a sheet metal templet and do the job as a contour bore with a tracing attachment: bid price $35. The astounded contracting officer said, "You've put the decimal point in the wrong place." "Indeed I have," said the bidder, who knew the hazard of being too far out of line. He raised his bid to $350 and got the job.

Auto Grease

END OF THE GREASE FITTING for the automobile was foreseen at the recent meeting of the National Lubricating Grease Institute, where the prospect probably didn't spread too much cheer. One set of speakers reported that optimistic manufacturers think it will take three years—the pessimists think it will take five. We reported more recently that there will be no grease fittings on one car next year—the guessing is the Ford small car. So it looks like the grease fitting will join the whip socket in something less than the five years forecast by the pessimists.

MEMOS

by BESS RITTER

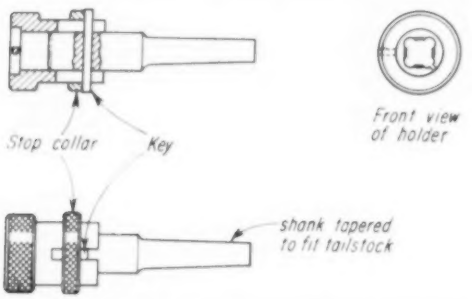
When a machinist of today is unfortunate enough to lose his job, he has more right than any other type of employee to claim that he has "got the sack," because this expression originated with workers like himself: It seems that in the old days they were required to bring their own tools. They usually carried them in cloth sacks, and the latter were left in custody of the employer during the entire term of employment.

When a job was completed, or a man was let go for some other reason, instead of giving him notice, as is customary today, he was merely told at quitting time that his services were no longer needed. Then he was given his salary and his sack. So, whenever he "got the sack" this meant that he had lost his job.

When the dramatists of ancient Greece happened to get their characters involved in problems that were absolutely beyond solution, the play was saved with the help of machinery: This consisted of an actor, who was dressed up to resemble a god. He was swung upon the stage via a crane, and his purpose consisted of straightening out the plot so that everyone could henceforward live "happily ever after."

This character was so familiar to the average Greek audience that he was known as the "theos apo mechanes," or (to put it more plainly) "the god from the machine."

Practical Ideas...



Die Holder is Semiautomatic

The advantage of this tailstock-mounted tool is that a thread can be cut to a predetermined length without cutting tool or gear changes. Work on such pieces as fulcrum pins and special screws is simplified because of a semiautomatic threading operation.

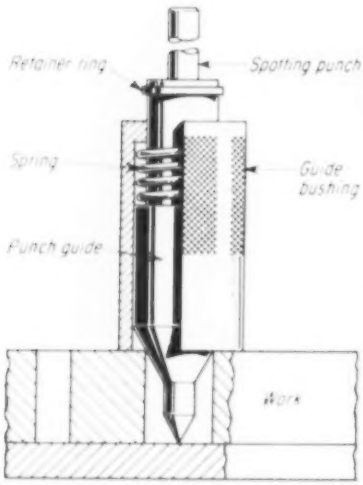
This tool is a big timesaver in that parts can be turned out in quantity, complete with threads, on a standard lathe. An adjustable collar allows the operator to confidently run a die on a workpiece knowing just how far the thread will be cut each time. The control is achieved by a collar which is positioned and locked at the same distance from the slotted end of the holder as the length of thread required.

To cut the thread, the end of the work is slightly beveled with a file. The holder is then slipped onto the shank until stopped by the collar striking the key. Introducing the die to the work with the tailstock handwheel, starts the die cutting and feeding itself onto the work. As soon as the holder clears the key, it will rotate with the work.

Because this tool was designed to be used in a small lathe, the sizes are naturally small. A number 2 Morse taper is machined on the shank to suit the tailstock quill. The remainder of the shank is 1 in. dia and 2 7/16 in. long. A ¼-in. key is inserted about midway and diametrically through the shank.

The 2½-in.-long holder is bored to a sliding fit on the shank. A counterbore accepts 1¼-in. button dies. The stop collar has a close fit on the 1⅝ in. OD of the holder and is equipped with a ¼-in. setscrew for locking. (Some designers may prefer a threaded stop collar to eliminate any chance of its slipping—Ed.) A ¼-in.-wide slot runs 1¼ in. into opposite sides of the holder wall to receive the key.

J W Cocup, London, England



Compact Spotting Tool Transfers Hole Locations

Hole locations can often be transferred from one workpiece to another with a drill of the same size as the hole. There will be times, however, when it is more convenient, and sometimes the only way, to use a spotter. Drillrod can, of course, be used to make individual spotters, but these will add up to quite an accumulation if all sizes are to be covered.

The illustrated tool, having a guide diameter of 9/16 in. and using a 3/16-in. dia punch, can accurately spot transfer holes within that range. Spotters with smaller or larger capacities, or a second one to extend the range, are made the same way.

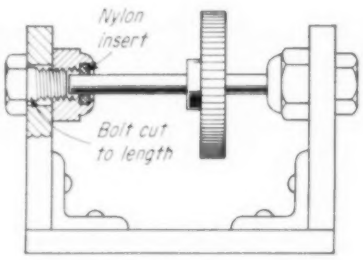
The knurled bushing, which guides the punch guide, holding it perpendicular to the face of the work and maintaining spring pressure, is bored to 9/16 in. with a 7/16-in. through hole. The punch guide is turned with a slip fit in both bores of the bushing. A 3/16-in. reamed hole runs concentrically through the axis of the guide and terminates in the center of its 60° point.

After the two parts have been assembled with a light compression spring inserted in the bushing, an external retaining ring slipped into a groove keeps them together. The punch is a piece of drillrod with a hardened concentric point.

A E Salmons, Norristown, Pa

Nylon-Insert Nut Becomes Experimental Bearing

In instrument work, fabrications for experimental work are often necessary. When bearings must be made to support a shaft, the work can be greatly simplified with the illustrated shortcut.

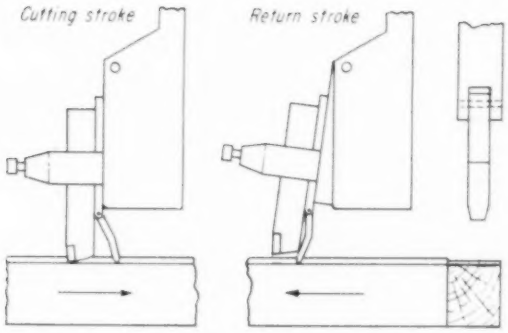


This method employs a pair of self-locking nuts of the kind most extensively used in the aircraft industry. These nuts are made with nylon inserts (a nylon washer near the top edge of the nut) which grip the threads of the screw in assembly. The gripping effect is achieved because of the fact that the ID of the insert is smaller than the major diameter of the thread.

It is this feature that makes it possible to utilize these nuts for the support of a small shaft. The nuts are assembled on uprights with the aid of short screws as shown. When exact locations for the nuts are unknown, the mounting holes are drilled oversize to provide the necessary adjustment. Mounting bolts are cut short to allow full shaft bearing. Further adjustments to control end play is made by filing the shaft ends.

S Topping, Belfast, Ireland

Simple Tool Lifter Protects Carbide-Tipped Planer Tool



Carbide tools are fine, and are sometimes the only tool that can be used on certain materials, but they have the characteristic of being brittle. They can, therefore, not be dragged backwards over the surface of a workpiece, as in planing or shaping operations, without causing damage to the cutting edge.

It is for this reason that modern planers and shapers are equipped with automatic hydraulic tool lifters. Operators of older machines are obliged to give their undivided attention to the job, which usually means hand lifting the tool on each return stroke.

I have found a solution in a simple shop-made tool lifter we now use on all planers and shapers. Its operation is simple and foolproof, and, once the cut has been started, needs no further attention.

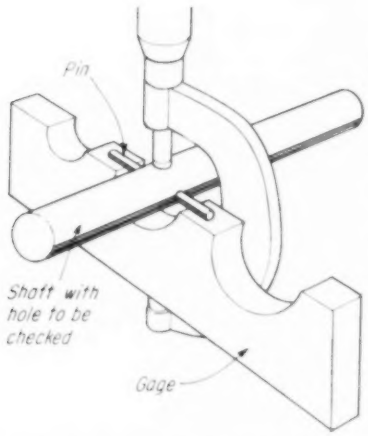
The lifter consists of two parts, a holder and a tang hinged together. The holder is a piece of flat machine steel. Our dimensions for this part are ¼ x ¾ in. but it can be made as heavy as the capacity of the toolpost or clamps will permit. Its length is about the same as a full-length tool.

The tank is 1½ in. long and made from ¼ x ⅜ in. stock. After it has been fitted to the holder and given a slight bend as shown, it is case hardened to resist wear. A pin, riveted at both ends, joins the two parts allowing the tang to swing freely.

When installing the lifter the tang should protrude a few thousandths beyond the cutting edge of the tool. The best way to do this is to place the lifter in the toolpost with the tool on top of it. Before tightening, put a shim between the work and the point of the tool while the lifter rests directly on the work. The shim need only be a few thousandths of an inch thick.

As the screws are tightened, the lifter will extend that much further and will strike the work first on the return stroke. To prevent the tool from being chipped at the end of the return stroke, a block of wood is clamped against the workpiece to delay the tool's dropping. During the cutting stroke the lifter drags behind the tool.

John S Reeves, Tottenham, England



Hole-Through-Shaft Location Checked With Aid of Gage

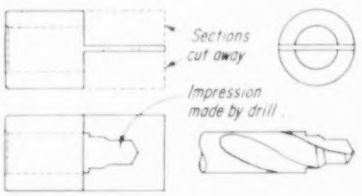
The diametrical accuracy of holes drilled through shafts and similar parts is sometimes difficult to establish. When such information must be had, as is often the case in drill jig and fixture construction, the gage shown will be of great value to the toolmaker.

The gage is made by simply drilling a few holes of various sizes through a piece of ¼ x 1 x 3-in. tool steel. It is then sawed into two halves through the centers of the holes. As these half holes are only for clearances, no particular finish is necessary. The sawed surface, as well as the opposite face, are ground before and after heat treating to insure accuracy.

To use the gage, insert a pin (not necessarily a snug fitting one) through the hole to be checked. Place the shaft over a hole that will clear it with the pin resting on the ground surface of the gage. Measure the distance from the top of the shaft to the base of the gage and make a note of it. Now with the pin still in the hole rotate the shaft 180°, rest it on the pin and again measure the overall height.

If both measurements are alike, the hole is centered. If they are not the same, the difference is divided by two to find the distance the hole is off center. When properly used, this gage can help to locate the center of a shaft within tenths of thousandths of an inch.

Walter Gerstel, Berkeley, Calif



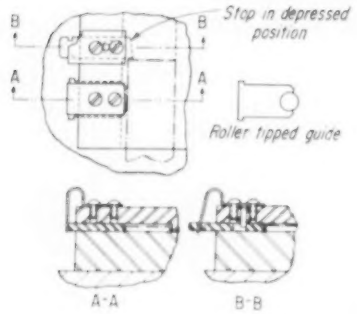
Sight Gage Checks Step Drills

Regrinding step or subland drills is a tricky job because the relation of the steps to each other must be held within close limits. The illustrated gage makes this job as easy as it is to produce the gage itself.

After the initial tool has been inspected and okayed, a round piece of steel is drilled out with the accepted drill. Each side of the piece is then milled away to form a ⅛-in. wide crest over the center of the hole. Narrower gaging edges, resulting in easier definable surfaces are produced by putting a bevel on each of the inside edges. The gage is stamped for identification after which it is hardened and kept ready for checking future regrinds.

Roger Isetts, Kenosha, Wis

Practical Ideas...



Flat-Ground Stock Simplifies Stop and Guide Construction

Too much emphasis is sometimes placed on the construction of finger stops and spring stock guides. As a result, these details become too elaborate and unnecessarily costly.

When they are made from flat-ground stock, material cost is low with construction, application, and operation simplified. The only work necessary to install these stops or guides is on the stripper plate where a stock slot is machined on its underside.

Holes are drilled and tapped for mounting the springs, and slots are milled across the front-stationary guide to receive the stop and spring guide. If separate stationary guide strips are used between the stripper and die, the only difference will be in the number of screws needed to secure the cut front-guide strip.

The springs are made as shown in the sketch. All are fashioned alike with the exception of the tension direction and the ends engaging the stop or guide. Section A-A shows the way a plain-end spring applies pressure to a guide. In section B-B, the end of the spring is fork shaped to engage a slot on either side of a stop. In this case, tension is away from the die, withdrawing the stop from the path of the stock. The stop must be pushed in to be activated.

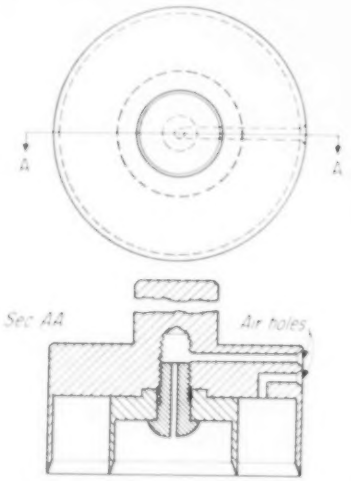
An improved roller-tipped guide is shown in the upper right-hand corner of the illustration. Less friction and longer life are two reasons for its use. A hardened and polished disk of the same thickness as the guide is nested in an opening at its point. The center of this opening is located inside the end of the guide to retain the disk.

F Murray, Chicago, Ill

Drillpress Tool Cuts Rubber

Holes, washers, and ring gaskets are easily cut from rubber with the tool shown. It is made with a removable inside-diameter cutter which is removed when a plain disk or just a hole in the stock is desired. The inside cutter is installed when a washer or a ring gasket is to be made.

For a cutter of not too large a diameter, the circular knife and shank can be made in one piece. In other cases the shank may either be threaded or welded in place. Whichever method is used, the shank ought to be completed first and then gripped in a true spring collet or chuck to maintain concentricity between cutting edge and shank.



The OD is next machined to the diameter of the washer, plus double thickness of the knife wall dimension. The bore is then completed to produce a wall thickness of from 0.010 to 0.020 in. with the edge finished at a 20° angle. A pilot recess and a tapped hole to locate and secure the inside cutter are machined in the same setting after which both sides of the cutter knife are polished.

The inside-diameter cutter is machined in the same way as the larger, except that the OD is turned to the diameter of the hole required. A pilot is turned on the back face to fit the recess in the bottom of the larger cutter. To prevent slippage, a small drive pin is inserted through the ID cutter into the larger. Two $\frac{1}{8}$-in. air holes connect with the inside of both cutters permitting washer and slug to be blown out with an air blast.

William Kreusser, Stamford, Conn

H. J. GERBER
Stillwater, Okla

$25 In addition to regular payment for his idea:

SPRINGS SIMPLIFY CHUCK MOUNTING

in the Nov 17, 1958 issue

An extra $25 will be paid for the best Practical Idea in each issue of *American Machinist*. Selection of the winner is made by a group of our readers.

PAYMENT—$25 in addition to regular rates for the items published to be paid as soon as reader votes are received—usually three to four weeks after the date of issue. The winner will also be announced in these pages as soon thereafter as practicable.

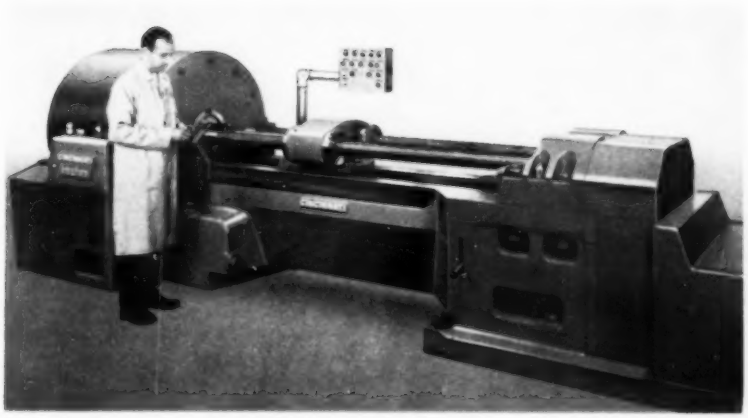
JUDGES—A group of 200 *American Machinist* readers is asked to select preferred articles in each issue. The group is a true cross-section of all readers, and changes entirely each time. Their votes, in addition to guiding the editors, select the best Practical Idea. If at any time their votes result in a tie, $25 will be paid to each co-winner. Decision of the readers will be final in each case.

REQUIREMENTS—Only items in the Practical Ideas pages are eligible, and they must be submitted directly by the originator. Do not worry about your shortcomings as a draftsman, photographer, or author—every item will be edited in accordance with *American Machinist* standards and suitable illustrative or explanatory material added where needed. Readers will judge only the finished product—in terms of its usefulness to them.

WHO MAY ENTER — Anyone may enter except employees of the McGraw-Hill Publishing Co, Inc, and those of advertising agencies or departments. Suggest to your employees that they submit ideas.

HOW TO ENTER — Send all entries to "Practical Ideas Editor," American Machinist, 330 West 42nd St, New York 36, N. Y.

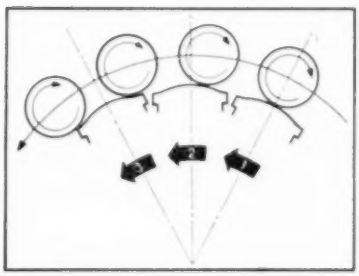
New Shop Equipment
Materials and Parts



Chipless Machining Process Produces Complex ID Profiles With Low-Cost Tooling

This new chipless machining process, performed on Cincinnati Intraform machines, forms profiles on the ID of cylindrical workpieces. Briefly this is what takes place: Hollow cylindrical stock is placed over a mandrel and squeezed by rapidly pulsating dies. At the completion of the operation, the profile of the mandrel has been reproduced in the ID of the part, and the hardness, tensile strength and surface finishes have all been improved. Profiles produced range from internal shapes on which tolerances are not critical to the highly accurate lands and grooves in rifle barrels.

The Intraform uses a set of four forming dies which pulsate rapidly while revolving around the OD of the workpiece. The dies, mounted on cams, are caused to pulsate through contact with a series of free-wheeling, hardened steel rollers located in a raceway in the machine's headstock. There is no hammering effect. Consequently, noise and vibration are no problem, even though the workpiece is being squeezed more than 1000 times per second.

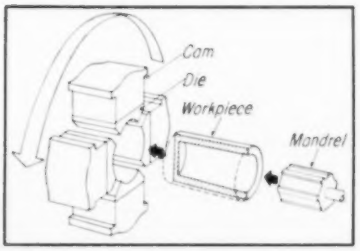


Actuating cams of the forming dies move without interruption from one roller to the next. (Sketch shows the cam of one of the four dies.) Sine curve form in contact with roller results in smooth, quiet squeezing action

Operation

The workpiece is placed over the mandrel, then both are fed into the Intraform headstock. As the dies form the workpiece, contact with the rotating dies causes the part, and therefore the mandrel, to revolve—but at a speed somewhat slower than the dies. At the same time the workpiece is fed over the mandrel and toward the rear of the headstock. Since the workpiece feeds, but the mandrel does not, long workpieces may be formed with a short and, therefore, relatively inexpensive mandrel.

Since tooling is relatively simple to machine and install, the Intraform may be used to good advantage on short production runs and development work. But at the same time the machine has the capacity for forming parts on a high production basis.



Mandrel profile will be reproduced in the ID of the workpiece. Workpiece is placed over mandrel and both are fed in headstock. The stock feeds through but the mandrel does not. New blank pushes the finished part out

The operation itself is fast and, if production warrants, the machine may be equipped with hopper feed and an automatic operating cycle.

Applications

Standard Intraform machines cold form both ferrous and nonferrous workpieces ranging from ⅛ to 5 in. in diameter. Workpieces may be premachined blanks, tubing, castings, forgings, extrusions, or powder metal parts.

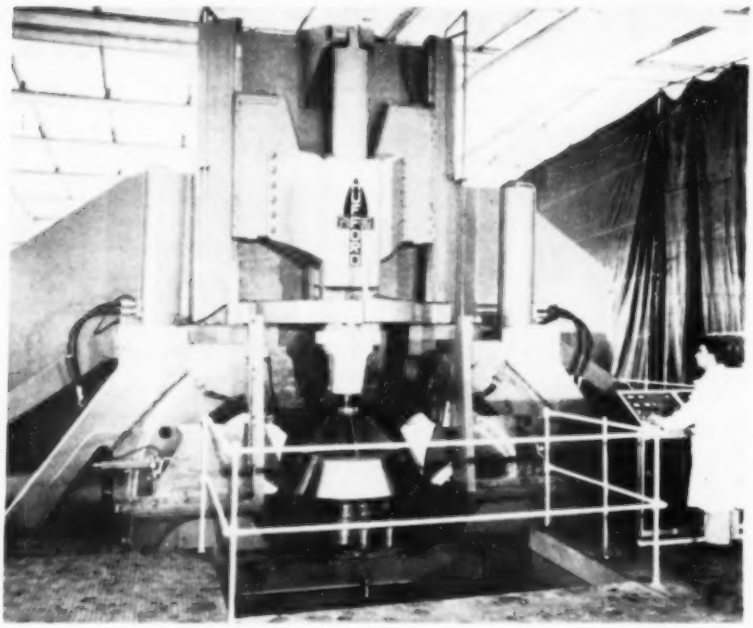
Besides forming profiles in open or blind holes, the machines have other applications. They have been used to bond two or more metals for use in laminated tubing. The bond produced is strong as well as tight. Other applications include pointing, reduction of tube diameters, and forming of tapered tubular parts. These latter applications do not require the use of a mandrel. Similar operations may also be performed on solid workpieces.

Advantages

One of the most important advantages is the ability to form to close tolerances and to produce excellent finishes. On many jobs, over-all limits for size of 0.0002 in. can be held on the OD profile. The improvement in physical properties of the material has been described. Because the Intraform moves metal instead of removing it, less stock is required than for conventional machining.

The Cincinnati Milling Machine Co, Meta-Dynamics Div, Cincinnati 9, Ohio

MORE DATA? Circle 51, inside back cover



Spin-Forging Machine Forms Metal Parts Up to 60 in. in Diameter and 10 ft Long

The Hufford Spin Forge, the first in a series of giant "space age" machine tools, is capable of applying a total work force in excess of one million pounds to form parts up to 60 in. in diameter and 10 feet long. The machine combines the principles of rolling and shearing to produce mechanically spun surface-of-revolution sections such as conical, tubular, or parabolic configurations, with varied wall thicknesses.

The metal to be formed is placed on the machine's mandrel, a form that has the same shape as the desired part, and is held tightly in place by a vertical tailstock, or hydraulic ram, that can exert 200,000 lb of force. The mandrel rotates at speeds up to 400 rpm as two massive working rollers, set across from each other at either side of the mandrel, come in to force the metal over and around the form.

Designed to meet new requirements in component size, shape, tolerances, and materials created by recent advances in aircraft and missile technology, the Spin Forge machine is tracer controlled. An electronic tracing head follows a templet and controls a hydraulic servo valve which in turn controls a variable volume pump. The tracing feed rate is adjustable during forming and may be preset to provide either a constant feed per revolution (0-100 in./rev) or to maintain a constant rate regardless of spindle speed (0-40 in./rev).

Production capacity

Here are some examples of the capability of the machine:

- A tubular center section for a standard pressure vessel with 50-in. dia, 100-in. length and ¼-in. wall thickness can be formed in 5 min.
- One of the acceptance tests (this first unit is going to Marquardt Aircraft) for the machine was to take a 1-in.-thick, 60-in.-dia blank of 321 stainless steel (Rockwell hardness 90-B) and form it, in a single pass, into a truncated cone with a 60-in.-dia base and a wall thickness of ½ in.

Forming strengthens material

The spin-forging action actually strengthens the worked material. As an example: A part made from 4130 steel, with the metal in a fully spheroidized annealed condition, had a tensile strength of 80,000 psi with a hardness of 90 to 96 Rockwell B prior to forming. After forming on the Spin Forge the material had a 160,000-psi tensile strength, grain elongation of four to six percent, a hardness of 35 to 37 Rockwell C.

Hufford Corp, Div of Siegler Corp, El Segundo, Calif

MORE DATA? Circle 52, inside back cover

Simple Air Gage Measures Accurately to 0.000001 in.

Model AG can be used to check IDs or dimensions, ODs or dimensions, and center distances of holes, regardless of hole size. It can also be used for checking roundness of OD, ID, and blind holes on small precision parts.

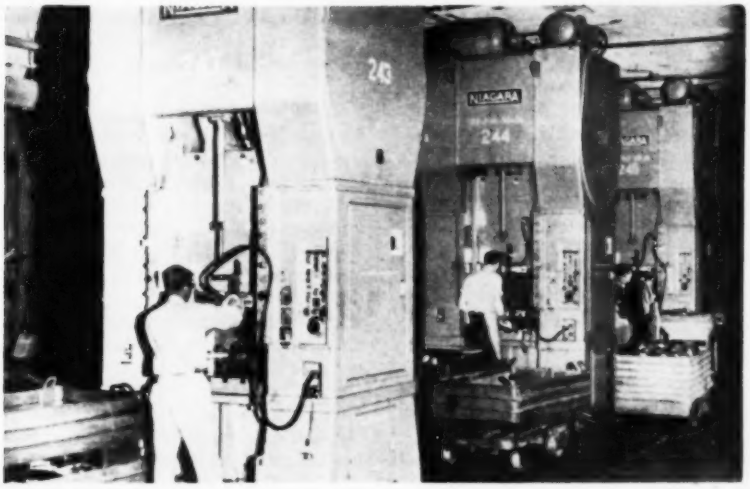
Meter reportedly has high linearity and zero hysteresis. If permanent record of measurements is required, an electric recording unit may be added to the gage. Zero setting can be obtained by using either a master or proper size blocks. Once a zero setting is made, a three-point contact enables the user to detect a 3, 5, or 7-lobe condition in centerless grinding.

B C Ames Co, Waltham, Mass

MORE DATA Circle 53, Inside back cover

HYDRAULIC MOLDING PRESS, 285-ton capacity, has insulated platens for molding fiber-glass. Press has 36 in. stroke and can be opened to 5 ft. The 6-in. hydraulic actuating cylinder operates at 5000 psi. Total weight of press is 30,000 lb—*Remco Mfg Co, 934 S Main St, Willits, Calif*

MORE DATA? Circle 54, inside back cover



Niagara Redesigns, Expands Its Line Of Straight-Side Crank Presses

Built in a combined range of 50 through 500-ton capacities, single and double-crank press line is available in non-geared, single-geared, or double-geared models with either single or twin-end drives. Two types of construction can be furnished, standard and enclosed.

Standard presses feature all-steel, rigid, one-piece and four-piece frames of triple box section design that provide max resistance to deflection. Shut-height and slide adjustment permit use of an extensive range of stamping and forming dies. Long, adjustable gibs fully contain the slide during the working portion of the stroke. Driving mechanism is entirely concealed; flywheel, clutch and brake are housed in the crown. Units have centralized pressure lubrication.

Self-contained, enclosed presses, built in capacities of 150 tons and larger, incorporate all of the basic standard press features, plus advanced electrical and pneumatic controls, as well as automation devices as built-in components.

Niagara Machine & Tool Works, 683 Northland Ave, Buffalo 11, NY

MORE DATA? Circle 55, inside back cover

Deep-Draw Lubricant Permits Drawing at 200,000 psi, 450 F

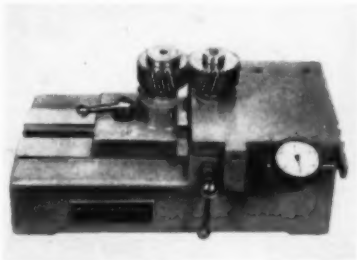
Formulated for deep drawing operations at temperatures to 450 F and pressures to 200,000 psi, this compound, designated 700 Wax-Draw, will continue to adhere to metal through multiple draws and may be readily diluted with water to any desired film thickness. Application is simple, the product being applied by roller coating, spraying, dipping, etc.

After drawing, the compound can be removed with the simplest cleaning operation, even hot water alone.

Coated blanks may be drawn either wet or dry, thus the wax coating can be easily adapted to continuous press operations. One gallon of the coating (undiluted) will cover as much as 2000 sq ft of metal. It will cover proportionately more when diluted, and dilutions of four to one are reported to produce excellent results. Product is sold in 5-gal cans and 55-gal drums.

S C Johnson & Son, Inc, Special Industrial Products Dept, Racine, Wis

MORE DATA? Circle 56, inside back cover



Gear-Rolling Fixture Checks Gears up to 10 in. in Diameter

This lowcost bench-type gear-rolling fixture checks external spur and helical gears for size, eccentricity and meshing smoothness. Designated Model 607, this unit will handle gears up to 10 in. in diameter. This is done by manually rotating (or rolling) the gear to be checked against a master gear. All deflections are shown on an integrated dial indicator in increments of 0.0005 in.

A replaceable precision bushing is used on the master gear and part stud. Master gear rotation can be in the bore of the master or in the bushing, greatly extending the service life of the equipment.

The center distance can be adjusted from $1\frac{3}{4}$ to 6 in. Master-gear arbor diameter is 1 in. (other sizes available); the gear arbor diameter is matched to the application. The unit is about 7 x 15 x $5\frac{3}{4}$ in. high.

Michigan Tool Co, 7171 E McNichols Rd, Detroit 12, Mich

MORE DATA? Circle 57, inside back cover

Variable Speed Drives Provide Size Reductions up to 35%

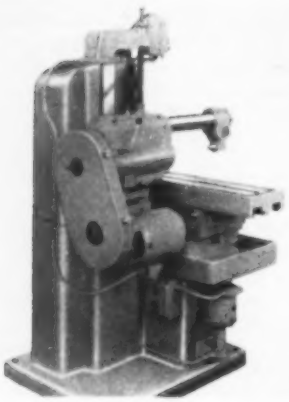
Called the Super T V-S Drives, these packaged drive systems provide size reductions up to 35% over comparable existing drive units from three to 350 hp. Drives are built around the newly redesigned NEMA ac and dc motors and generators that are much smaller than previous units.

The drives are offered in two basic styles—a custom model for extremely complex operating requirements, and a standard model for normal industrial applications. Among the features are a preset speed control device that provides speeds over an 8:1 range through armature control, and over a 4:1 range through field control; a pressurized control cabinet that keeps out dust; and improved ventilation.

Unit illustrated has the front panel removed. The motor-generator set at bottom features Class B insulation.

Reliance Electric and Engineering Co, 24701 Euclid Ave, Cleveland 17, Ohio

MORE DATA? Circle 58, inside back cover



Bed-Type Milling Machine is Available in Three Models

The No. 1 bed-type milling machine, for rapid milling of light and medium production work, is available in three standard arrangements. Each of the models has lever feed for rise and fall of lever head; micrometer cross adjustment of saddle; 3-in.-dia adjustable overarm and heavy arbor support; 1-hp geared head motor and six spindle speeds in two ranges (111 to 1105 rpm or 247 to 2463 rpm); push-pull selector switch and starter. A 1½-hp motor is available as an optional feature.

Model 1A, for economy on small lot production work, has 9 13/16 x 27-in. table work surface with single T-slot, 10-in. stroke, and micrometer table stops. Model 1B with hydraulic feed is for longer production runs. It can be equipped with the same size table as the Model 1A or with a 32-in.-long table with three T-slots, 15-in. stroke. Feed is adjustable from 1½ to 40 ipm; rapid traverse rate is 100 ipm. Model 1C is for low production and toolroom work. It is equipped with the 9 13/16 x 32-in. table and has handwheel screw feed and micrometer table stops. A standard line of attachments is available for all machines.

Producto Machine Co, 990 Housatonic Ave, Bridgeport 1, Conn

MORE DATA? Circle 63, inside back cover

Magnetic Transfer System Speeds Press and Shear Operations

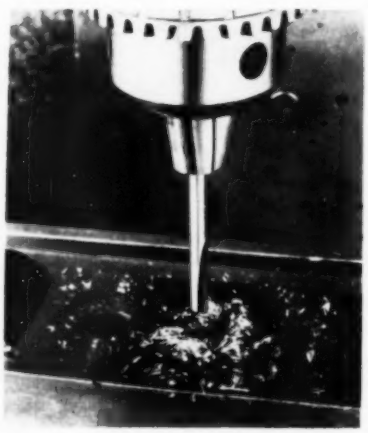
This magnetic transfer system, called the AAC Automatic Hand, is intended primarily for handling large parts as well as those which cannot be handled mechanically without damage. It can be used effectively with presses, roll forming machines, press brakes, shears, welding equipment, etc.

Each installation is custom engineered. Basic to any installation is the use of electromagnets and electromagnetic rollers which may be used either free standing, mounted on the machine, or in special frames. These magnets pick up the piece to be transferred and move it to the next station, where a switch is tripped releasing the piece. The piece may be picked up by another magnet for further transfer, fed into another machine, or stacked, as the operation requires.

Even non-magnetic materials can be handled; this can be done by placing a floating metallic roll beneath the piece to be moved.

American Actuator Corp, Box 584, Stamford, Conn

MORE DATA? Circle 64, inside back cover

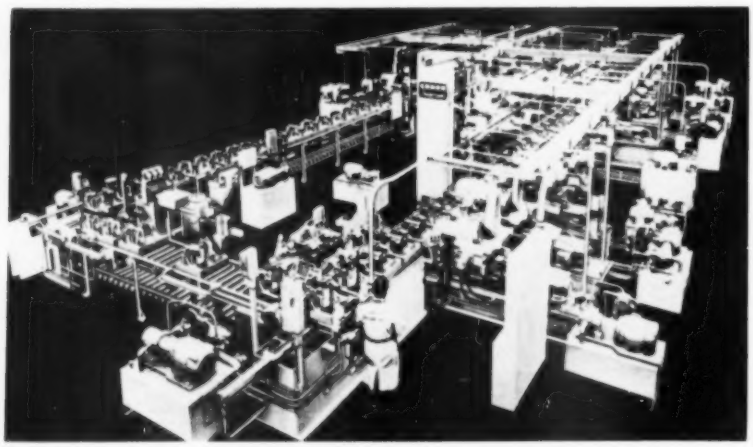


Chip-Cutting Carbide Drill Cuts Hardened Steel up to 65 RC

The Hi-Roc solid carbide drill is a chip-cutting drill designed for drilling in hardened steel. The tool features a special point and a flute form that eliminate annealing and any possible heat distortion of the workpiece.

Using a flood of water soluble coolant, the Hi-Roc drill permits a feed of up to 2 ipm in 60 RC materials. Constant heavy feeds of from 1 to 2 ipm are required to insure long drill life; drills dull rapidly with light feeds. Hand feeds are most successful; power feeds can be used if sufficient pressure can be maintained and provision is made for breakthrough.

A cutting speed of about 90 sfpm provides best performance. These fast cutting drills are available in



HYDRAULIC STEERING GEAR HOUSINGS are machined and inspected on this sectionized, pallet-design Transfer-matic. Sixty-six operations are performed on each part as it passes through the 55 machine stations. Rated capacity of the machine, which is built to JIC standards, is 200 pieces per hr at 100% efficiency —*Cross Co, Fraser, Mich*

MORE DATA? Circle 65, inside back cover

NEW LOOK IN PRODUCTION LINES

From Material to Product in ONE PACKAGE

Need help to reduce your manufacturing costs and raise your production? Why not check Federal/Warco Packaged Production Lines – automated production from coil strip or sheet blanks to finished product.

Only Federal can offer you actual single source responsibility with major line components of resistance welders, punch presses, mechanical welder presses, automatic arc welders, expanders, destackers, transfer equipment and digital control – all designed and built in Federal's plants.

Federal pioneered and are leading designers and builders of packaged lines. Talk with a Federal representative when next you're planning production welding or press equipment.

Federal / Warco
PACKAGED PRODUCTION LINES

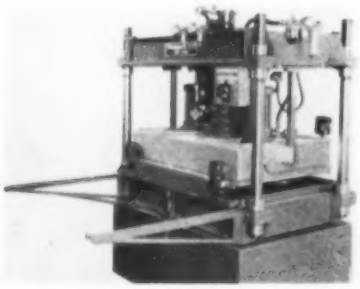
THE FEDERAL MACHINE AND WELDER COMPANY - WARREN, OHIO

AFFILIATED WITH BERKELEY-DAVIS, INC., DANVILLE, ILLINOIS, MANUFACTURERS OF AUTOMATIC ARC WELDING EQUIPMENT

diameters from 3/64 to ½ in., with flute lengths from ¼ to 1 in. Prices range from $5.80 to $29.90 each. The drills can be purchased individually or in sets. The company also offers a repointing service at nominal cost.

M A Ford Mfg Co, Inc, 1545 Rockingham Rd, Davenport, Iowa

MORE DATA? Circle 66, inside back cover



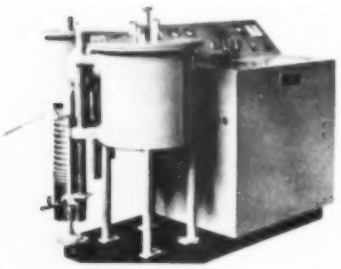
Air-Hydraulic Die Cutting Press Cuts Plastics Without Trimming

Unit is designed for cutting rigid plastics and plastic-like materials in one stroke, eliminating trimming operations. Model uses low-cost steel rule dies, and available shop air.

Loading and unloading is performed on the shuttle table outside of the press away from the ram. Slide positioning of the table in the press automatically readies the press for the die cutting operation. Unit is designed to accommodate both sheet materials and completed multiple vacuum-formed sheets.

Tronomatic Machine Mfg Corp, 1881 Park Ave, New York 35, NY

MORE DATA? Circle 67, inside back cover



Stokes Vacuum Furnace Operates At Temperatures up to 4000 F

Model ST-58-84 is designed for sintering powder metal parts compacted of materials with a very high melting point, such as tantalum, or for degassing components such as tungsten elements for electronic tubes, requiring equally high temperatures, as well as for other heat-treating operations, either in experimental work or small-scale production.

Furnace is 5 ft 4 in. long, 4½ ft wide, approx desk-top height. Within the vacuum retort, which is 20 in. in dia and 20 in. deep, is a hot zone 3½ in. in dia and 6½ in. deep, produced by a resistance-heated radiant cylinder. This hot zone is surrounded by a water jacket. Hot zones of varying sizes can be interchanged within the retort to handle work of different dimensions and types.

F J Stokes Corp, 5500 Tabor Rd, Philadelphia 20, Penna

MORE DATA? Circle 68, inside back cover

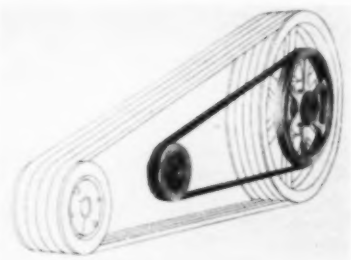
New Speed Changer Line Offered In Horizontal and Vertical Units

Vari-Tex line for smooth, instant speed variations is adaptable to a range of space conditions because of its four-position motor mounting and two-position gear mounting. One-piece motor and driver sheave shaft supported between bearings at the ends reduces shaft deflection.

Because unit is designed primarily for constant torque applications, speed ratios are dependent upon size. Four case sizes are contemplated in the complete line with a max speed ratio of 10:1 in the 1, 1½, 2 and 3-hp units, and 4:1 in the 40, 50, and 60-hp models; max ratios of the intermediate units will be 6:1. Each of the units can be assembled to provide intermediate ratios of 5:1, 4:1, 3:1, and 2:1, using an 1800 or 1200-rpm standard squirrel cage or Synduction motor in open, totally enclosed, explosion-proof, or Super-Seal construction. Full range of single, double, and triple-reduction gears is contemplated to obtain speed variations in the ultra-low-speed range.

Allis-Chalmers Mfg Co, Milwaukee 1, Wis

MORE DATA? Circle 69, inside back cover



Improved V-Belt Drive Design Offers Cost Savings up to 20%

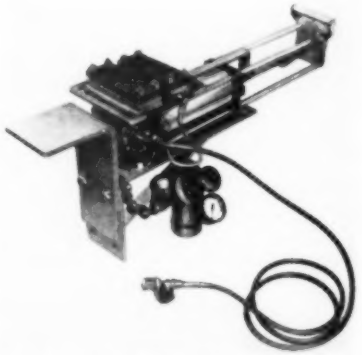
The Super HC V-belt drive with narrower, deeper cross-sectioned, high capacity belts and new narrower sheaves is reported capable of packing up to three times the horsepower capacity in the same space. Cost savings of up to 20% are possible.

The new design provides complete coverage of the range of drive requirements with only three cross-sections instead of the five formerly necessary. The arched top of the belt permits each of the tensile cords to carry its proper part of the load. Improved concave sidewalls assure precision fit in the sheave.

Illustration contrasts the new, smaller HC V-belt drive with drive presently used for a particular application.

Gates Rubber Co, 999 S Broadway, Denver 17, Colo

MORE DATA? Circle 70, inside back cover

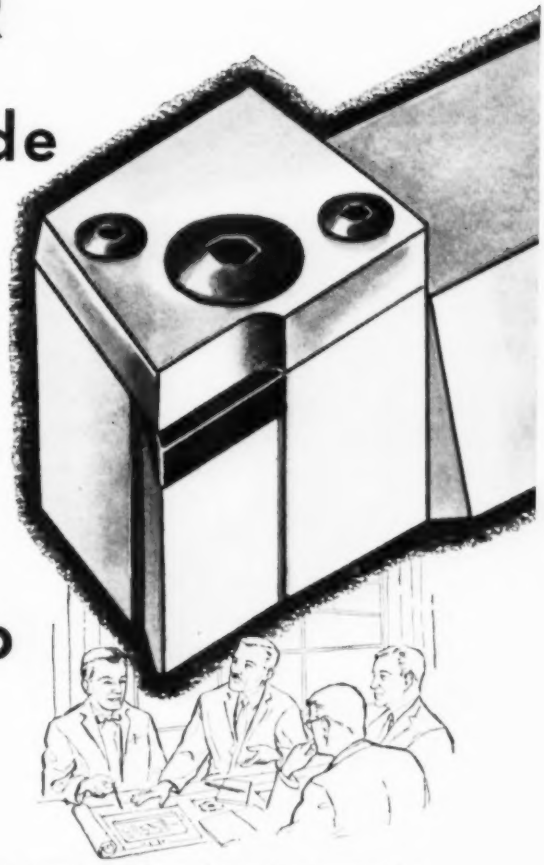


Punchpress Feed Converts Hand-Fed Jobs to Automatic

Renco-Aire portable, air-operated unit that feeds both strip and coil stock is available in four standard sizes for use with hand-fed punchpresses. It can be mounted without links or rods and can be shifted from one machine to another as job requirements change.

Grippers are opened for instant

Production Men ENGINEER the Carbide in the Tools... for Best on-the-job Results



PRODUCTION MEN KNOW cutting problems better than anyone else. That's why all V-R Carbides are engineered by production men to handle thousands of production applications. This fund of cutting know-how goes to work for you whenever you use V-R Carbides and cutting tools.

HERE'S THE POINT. You wouldn't specify 1020 steel for a job requiring a nickel-chrome 3140. Similarly, the proper Carbide grade is determined by the specific cutting problem. Give us the full details on your applications — V-R engineers will work with you to fit the right Carbide to the job.

COMPLETE LINE OF CARBIDE, CERAMIC AND TANTUNG® CAST ALLOY CUTTING TOOLS.

Send for new Catalog VR-58 for complete details

V-R Vascoloy-Ramet corporation

PRIME MANUFACTURERS OF REFRACTORY METALS ENGINEERED FOR THE JOB

C-704

828 Market Street • Waukegan, Illinois

loading and aligning of stock through the guide by means of the Renco-Aire Micro Valve. Stroke length is adjustable on the built-in feed control stop. Feed tolerances can be held as closely as ±0.002 in. With additional controls, stock grippers can be set to synchronize with progressive die operations. Models are available with 4-in.-wide by 13-gage, and 6-in.-wide by 13-gage capacities. Stock lengths are adjustable from ¼ to 8 in.

Cleveland Pneumatic Industries, Inc, 6¼ Old Orchard, Skokie, Ill

MORE DATA? Circle 71, inside back cover

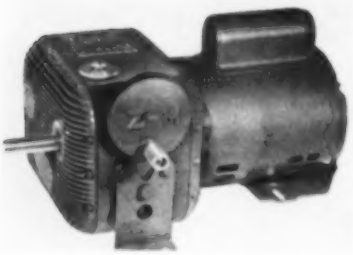
Lightweight Air-Powered Drill Designed for Close-Corner Work

Close-corner drill, Model No. 3RD1-450, weighs 5 lbs, has a speed of 450 rpm, drilling capacity of 9/16 in., reaming and tapping capacity of ⅜ in.

Unit is designed for interchangeability of many parts with other straight and angle drills in the Thor No. 3 air tool series.

Thor Power Tool Co, 175 N State St, Aurora, Ill

MORE DATA? Circle 72, inside back cover



New Zero-Max Speed Controls For Larger Fractional HP Motors

Heavy-duty speed reducers provide infinitely variable speed from 0 to 400 rpm, constant torque of 60 or 100 in.-lb delivered from ½ or ¾-hp motors respectively. Units, which will operate in any position, are designed for powering feeds, positioners, conveyors, and machine tools.

Feature of controls include accurate repeating of speeds and instant speed changes whether units are running or not. They will also serve as clutches going to zero rpm. Output shafts drive in either direction and are free-wheeling in direction of drive. Available with or without motors, basic dimensions of reducers alone are approximately 6 x 8 x 12 in.

Revco Incorporated, 1900 S Lyndale Ave, Minneapolis 5, Minn

MORE DATA? Circle 73, inside back cover

Tungsten-Carbide Spray Powder Speeds Hard Facing of Metal Parts

A new spray powder, for use with the Metco ThermoSpray gun, permits hard facing with sprayed tungsten carbide at very high deposit efficiency—better than 90% and extremely high carbide concentration. Coating speeds range from 110 to 150 sq ft per hr for a 0.001-in.-thick deposit. Any coating thickness may be applied.

Coatings are torch fused after spraying. Close control of coating thickness, plus the comparatively smooth surface finish produced, minimize finishing operations. This is very important because of the extreme hardness of the deposit.

Metallizing Engineering Co, Inc, 1101 Prospect Ave, Westbury, NY

MORE DATA? Circle 74, inside back cover

Certified Precision Gears Are Offered From Stock

Complete line, marketed under the tradename of APPCO, is offered in 32, 48, 64, 72, 96, and 120 diametral pitches of 14½ and 20° pressure angles. All gears and components are manufactured to exacting standards and tolerances set forth by AGMA and are certified and guaranteed to be within the prescribed limits.

Gears are available in 303 SS and 24S-T4 aluminum, anodized and treated for max corrosion resistance. They are finished in five types including standard pin hub, slotted or clamp hub, hubless or flat, inserted pin hub, and inserted clamp hub. All are offered in various bore sizes and face widths.

Atlas Precision Products Co, Dept 11, 3810 Castor Ave, Philadelphia 24, Penna

MORE DATA? Circle 75, inside back cover

Automatic Vertical Balancers Designed for Disk-Shaped Parts

New series of completely automatic Schenck vertical balancing machines for either one or two plane balancing (static or dynamic) is available in five standard sizes covering weight capacities from 0.5 to 1100 lbs.

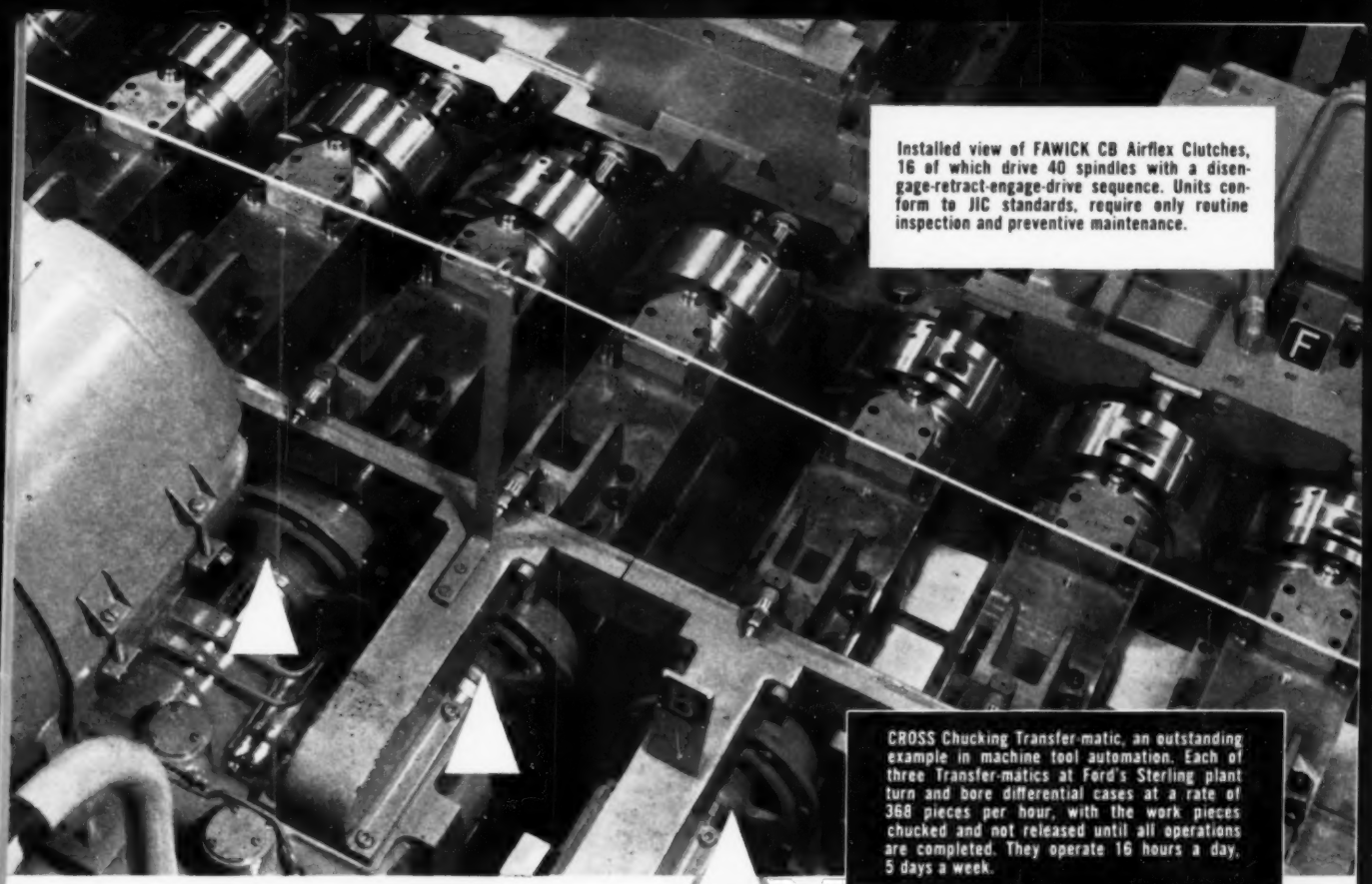
Units are especially suited for disk-shaped parts such as flywheels, fans, etc, for which tooling problems and loading and unloading of the work are much simpler than on horizontal machines. Work holder (arbor or faceplate) is integral with the balancing spindle and can be provided with a quick-clamping device. Once rotor is set up and the starting button pushed, machine runs automatically up to full speed; amount and location of unbalance is shown by a light spot on the instrument screen and frozen in position, and machine is electrically stopped. Complete cycle takes 10 to 20 seconds.

Imported by Cosa Corp, 405 Lexington Ave, New York 17, NY

MORE DATA? Circle 76, inside back cover

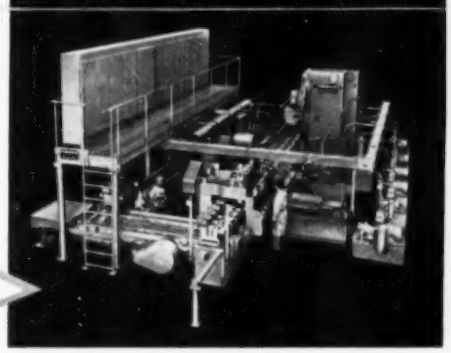
Shaft-Mounted Speed Reducers Offered in Sizes up to 40 hp

Shaftex reducer, with nominal internal gear ratios of 5:1, 15:1, and 20:1, is a completely enclosed unit for direct mounting on the driven shaft, and is available in single and double reduction models. It can be



Installed view of FAWICK CB Airflex Clutches, 16 of which drive 40 spindles with a disengage-retract-engage-drive sequence. Units conform to JIC standards, require only routine inspection and preventive maintenance.

CROSS Chucking Transfer-matic, an outstanding example in machine tool automation. Each of three Transfer-matics at Ford's Sterling plant turn and bore differential cases at a rate of 368 pieces per hour, with the work pieces chucked and not released until all operations are completed. They operate 16 hours a day, 5 days a week.



Fawick Clutches here... provide precision automation HERE!

■ Sixteen FAWICK CB Airflex Clutches provide the precision power-transmission link between driving members and 40 driven spindles. In this outstanding automated operation of the Cross Chucking Transfer-matic, FAWICK Clutches automatically disengage and retract from the driven drums at the end of each cycle. As the work pallets are indexed, the clutches engage and drive the next cyclic set of spindles. All operations and transfer of pallets to their new stations are simultaneous.

This installation is another example of the flexibility that FAWICK clutches provide to industry. *Instant response, lifetime "new clutch" action, full power transmission, greater operating safety and freedom from maintenance* are all "automatic" advantages supplied by FAWICK Clutches.

For detailed information contact your nearest FAWICK representative or write to the Home Office, Cleveland, Ohio.

FAWICK AIRFLEX DIVISION
FAWICK CORPORATION
9919 CLINTON ROAD • CLEVELAND 11, OHIO
Fawick Canada, Ltd., 60 Front St., West, Toronto, Ont., Canada

FAWICK AIRFLEX

FAWICK AIRFLEX CLUTCHES • AIR RING BRAKES • ROTORSEALS • SAFETY CLUTCH CONTROLS

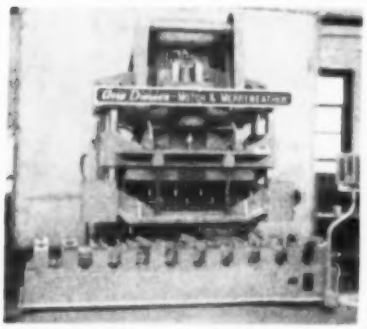
CIRCLE 255 READER SERVICE CARD

readily adapted without disassembly to include backstops, where reverse rotation is prohibited, and overload releases for chokable conditions.

Reducer is usually driven by a fixed-pitch-diameter Texrope drive. Variable speeds can be obtained by using either stationary control or motion control Vari-Pitch sheaves. For a higher degree of positive ratio transmission, unit can be operated with a Timetex timing belt drive.

Allis-Chalmers Mfg Co, Milwaukee 1, Wis

MORE DATA? Circle 77, inside back cover



CRANKSHAFT has six oil retaining holes drilled by a No. 4 Avey Hydro-Way unit that serves as a prime mover for a 6-spindle drill head and bushing plate mounted on four guide bars. There are six working stations, load and unload station, and three idle stations for automation—*Avey Div, Motch & Merryweather Machinery Co, Cincinnati 1, Ohio*

MORE DATA? Circle 78, inside back cover

Portable Blender Mixes Soluble Coolant Oil at the Machine

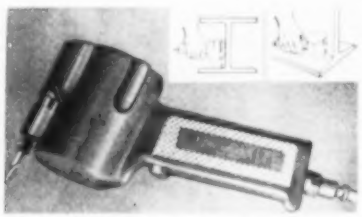
This portable coolant blender employs two positive displacement pumps linked to metering valves to allow infinite selection of coolant mixes ranging between one part oil, ten parts water (10:1), to one part oil, one hundred parts water (100:1). The water tank holds 75 gallons; the oil tank, 15 gallons.

Unit operates on 110/220-v line, and delivers up to 10 gpm at the nozzle. The oil-water ratio is unaffected by voltage or ambient temperature variations.

Portable blender is 33 in. wide, 45 in. long and 46 in. high. The blending portion of the unit can be supplied for permanent installation on central systems.

M J French Co, Inc, PO Box 22, Brighton Station, Rochester 10, NY

MORE DATA? Circle 79, inside back cover



Drill Motor Simplifies Drilling In Limited Access Areas

Hand drilling of holes within ¼ in. of bulkheads and other obstructions, and within 9/32-in. radius in 90° corners is said to be easily accomplished with the new Spacemite drill motor. Unit is reported to be better suited for heavy-duty applications where lighter-duty angle drills are commonly used. Rugged construction permits overload conditions up to ½-in. reamers or drills.

Model will take standard aircraft threaded shank drills (¼–28 thread), capacity through ¼ in. dia. Air consumption is estmiated at 18 cfm. Recommended air supply is ¼-in. airline with 90-psi pressure. Spindle speed is 3000 rpm (free speed).

Winslow Product Engineering Corp, 47 St Joseph St, Arcadia, Calif

MORE DATA? Circle 80, inside back cover

Allis-Chalmers Expands Its Gearmotor Line

New line of integral gearmotors in both the concentric shaft and right angle types for integral horsepower motors through 100 hp has been added to A-C line. Series of fractional horsepower integral type right angle gearmotors has also been introduced. Units are available with either open or totally enclosed motors, double and triple reduction in standard ratios.

Ratio changes are simplified through use of only one low-speed gear set for each drive size. Gear system has a minimum of moving parts. Openings are limited to one input cover and two shaft openings to provide oil-tight design.

Allis-Chalmers Mfg Co, Milwaukee 1, Wis

MORE DATA? Circle 81, inside back cover

Self-Locking Insert Provides Strong Threads in Any Material

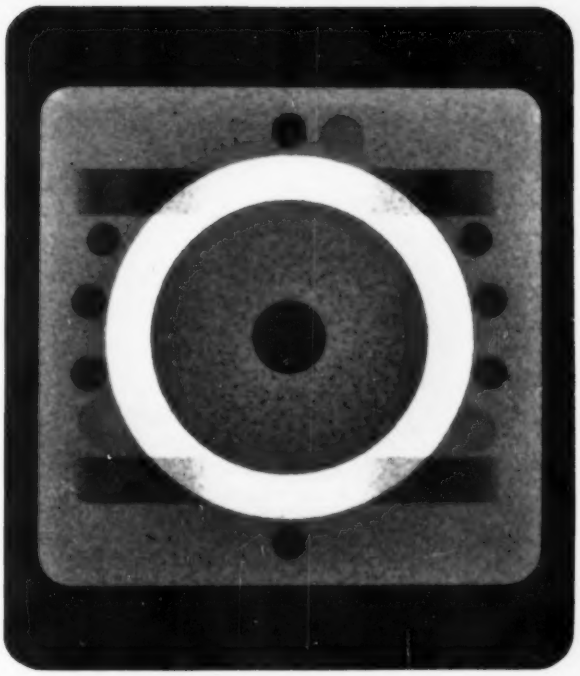
The Perma-Lock self-locking insert can be pressed into any drilled hole, eliminating threading in thin or heavy sections. Available with plain or threaded bore, the insert provides a fast, shock- and vibration-resistant means of adjustment for screws, pins, shafts, etc. A wide range of sizes and styles are available.

J B Plevyak Mfg Co, 19 Jefferson St, Newton, NJ

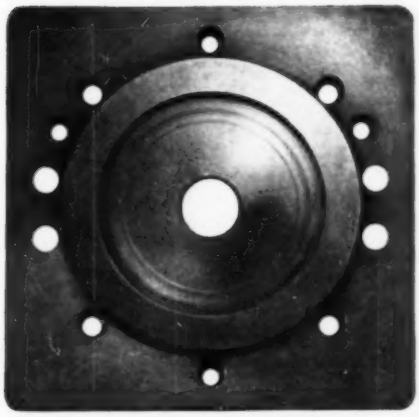
MORE DATA? Circle 82, inside back cover

NUT DRIVER, the Atom, consists of No. 8, 10, and 12 blades welded together at the hub to form one unit. Size in use projects outward; other two are held in the palm of the hand—*Hunter Tool, PO Box 564, Whittier, Calif*

MORE DATA? Circle 83, inside back cover



Radiograph shows porosity which caused markings to be fuzzy



Alloy casting for faceplate of aircraft instrument

End of a fuzzy face

SEE-AT-A-GLANCE clarity is an absolute *"must"* for aircraft instruments. So when one in development appeared with fuzzy numbers and index marks on its face, the cause and cure had to be found.

Sperry Gyroscope Company maintains a large and efficient x-ray testing department, hence the casting for the instrument face was promptly radiographed.

What the radiograph revealed was marked porosity. The conclusion was that the material used in applying the figures was being absorbed and sharp delineation was impossible. Therefore, a change in casting technic was indicated.

This is typical of the ways radiography helps the foundryman make sure only satisfactory work is delivered—make sure he is building and keeping a reputation for high-quality castings. If you would like to know how it can help you, call your x-ray dealer—or the Kodak technical representative—and talk it over.

X-ray Division . . . EASTMAN KODAK COMPANY . . . Rochester 4, N. Y.

Kodak Industrial X-ray Film Type AA

Read what Kodak Industrial X-ray Film, Type AA, does for you:

- Speeds up radiographic examinations.
- Gives high subject contrast, increased detail and easy readability at all energy ranges.
- Provides excellent uniformity.
- Reduces the possibility of pressure desensitization under shop conditions.

Kodak TRADE MARK

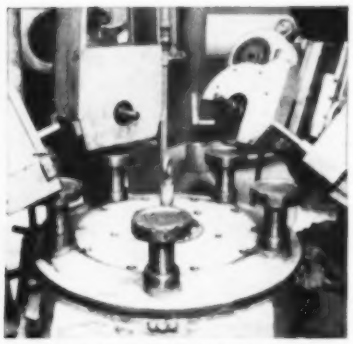
OSBORN®

BEFORE BRUSHING—Clutch back-up plate has sharp edges . . . carries fine chips and burrs inside teeth.

AFTER BRUSHING—Edges and surface junctures are uniformly precision blended. Chips and burrs are thoroughly removed to help assure troublefree performance.

Auto maker races to a perfect finish

. . . cleans, blends 450 parts-per-hour with OSBORN Power Brushing



4 POWER BRUSHING HEADS plus a 6-station index table setup produce a quality finish for automotive clutch parts. Osborn Monitor® Brushes—working at 1750 rpm—automatically deburr and blend 450 parts-per-hour in this low-cost operation.

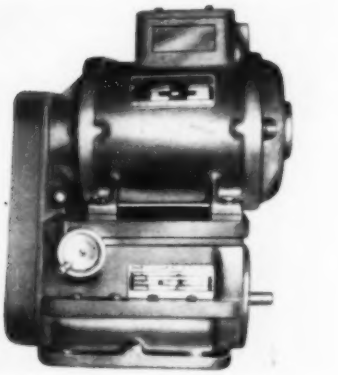
THESE clutch back-up plates—product of a leading auto manufacturer—are quality finished at high production rates with versatile, low-cost Osborn Power Brushing.

The job requires blending sharp edges and surface junctures of the intricately shaped parts . . . plus thoroughly removing fine metal chips and burrs that could later cause trouble in the clutch assembly. *This Osborn rotary power brushing setup does the entire blending and deburring job rapidly, uniformly, economically. Rate: 450 parts-per-hour.*

Low-cost precision finishing like this can be applied to many types of products you build today. An **O**sborn **B**rushing **A**nalysis—made in your plant at no cost or obligation—can pinpoint where *you* can speed production . . . improve quality . . . cut costs with modern power brushing methods. Write or wire us for details. *The Osborn Manufacturing Company, Dept. C-81 Cleveland 14, Ohio.*

Osborn Brushes®

BRUSHING MACHINES • BRUSHING METHODS
POWER, PAINT AND MAINTENANCE BRUSHES • FOUNDRY PRODUCTION MACHINERY



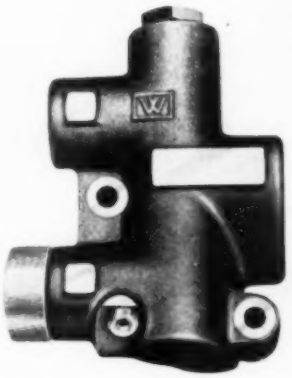
Hydraulic Variable Speed Drive Ranges From 0 to 750 rpm

Drive consists of 1½-hp electric motor that drives a variable displacement hydraulic pump which in turn drives a fixed displacement hydraulic motor. Rotation of handwheel provides infinite speed control from 0 to 750 rpm. Reversing lever provides instantaneous rotational change. Output shaft is ⅝ in. in dia, with standard keyway.

Over-all dimensions of the 90-lb unit are 12-in. long, 7½ in. wide, 16½ in. high. Price is under $125.

Roberts Mfg Co, 849 W Grand, Chicago 22, Ill

MORE DATA? Circle 84, inside back cover



PILOT-OPERATED RELIEF VALVE has manually operated knob for instant changes in pressure settings; twist of the knob can change settings from 500 to 2000 psi. Available in two sizes with capacities of 0 to 20 gpm or 0 to 60 gpm—*Webster Electric Co, Racine, Wis*

MORE DATA? Circle 85, inside back cover

Bronze cartridge gland with "LIPSEAL"® and "WIPERSEAL" can be easily replaced without dismantling cylinder.

HANNIFIN

hydraulic cylinders proved best by drip-free test

Hannifin series "H" hydraulic cylinder with the only drip-free rod in the industry.

Select either "Step-Seal" piston rings (standard) for most applications or inclusive "LIPSEALS" where zero "clearance flow" is required.

No oil dripping on machine, product or floor proves complete sealing of oil within the cylinder by our removable, replaceable bronze cartridge gland with the exclusive "LIPSEAL"® and "WIPERSEAL" combination. (This new-type gland is shown close up at upper left.) This gland not only seals better, its long bearing surface is inside the seals where lubrication is assured.

Other Hannifin cylinder features include ground and polished rods hardened to an extra-deep case, then hard-chrome plated and polished again; cylinder walls "Tru-Bored" straight and perfectly round *before* being honed . . . PLUS 48-hour delivery on most standard Hannifin cylinders whenever required.

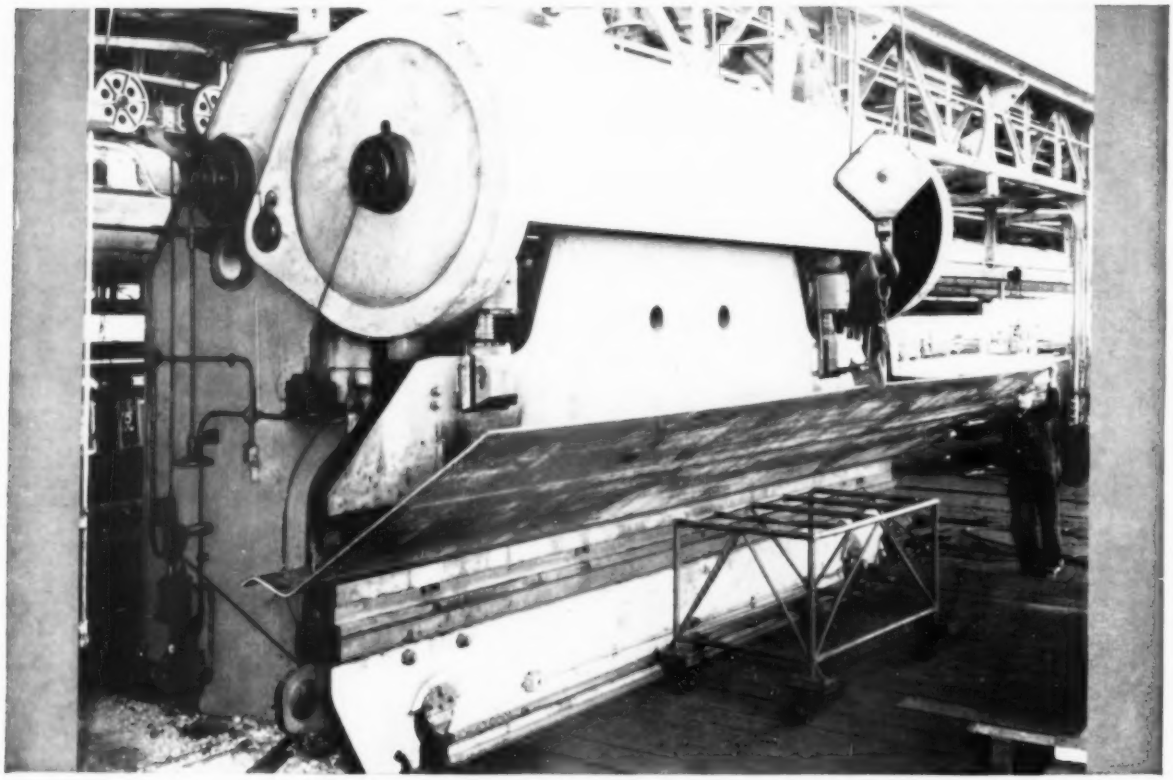
Your nearest Hannifin sales office or representative is listed in the A-Z volume of Thomas' Register. Call us in when cylinders figure in your designs. Or, for cylinder literature, write:

HANNIFIN COMPANY

515 South Wolf Road • Des Plaines, Illinois

U.S.S. KASKASKIA is typical of many ships which have had extensive bulkhead and other repairs at Moore Dry Dock Company.
Official U. S. Navy Photograph

Moore Dry Dock SPEEDS MARINE REPAIRS



Fluted bulkhead plate being formed by Steelweld bending press in plate shop of Moore Dry Dock Company for bulkhead renewal job on U.S.S. "KASKASKIA" (A027). Size of plate: length 26', width 6', thickness $\frac{1}{2}$".

Long a leading West Coast ship builder and marine repairs concern, the Moore Dry Dock Company, Oakland, California, has found a large Steelweld Bending Press to be a great asset in speeding the forming of heavy plate.

Ship repair, which constitutes an important part of the company's business, often requires replacement of large sections, such as bulkheads. This necessitates the forming of plates to various shapes to accurately replace those removed. Because of the power of their Steelweld and the ease of making adjustments, this work is carried on efficiently and satisfactorily.

The entire line of Steelwelds has an enviable reputation for continuous high-production performance. We urge you to get the facts on their many outstanding features.

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CATALOG No. 2010 gives construction and engineering details. Profusely illustrated.

THE CLEVELAND CRANE & ENGINEERING CO.
1462 East 281st Street, Wickliffe, Ohio

STEELWELD
PRESS BRAKES
BRAKING • FORMING • BLANKING • DRAWING • CORRUGATING • PUNCHING

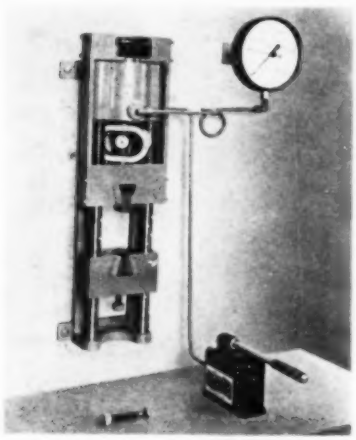
Preset Snap Torque Wrench Eliminates Error Factor

Wrench is preset to user's specifications at the factory, then sealed and clearly marked. Proper torque is reportedly delivered quickly and accurately each time wrench is used. Worker simply chooses the correct wrench specified for the particular application, then tightens until a distinct snap or pop is heard and felt. This indicates that the correct torque has been reached.

Damaged or worn hex socket keys can be readily replaced by the user from local industrial supply houses without danger of disturbing the balance of the calibration.

Skidmore Engineering Co, 5130 Richmond Rd, Bedford Heights, Ohio

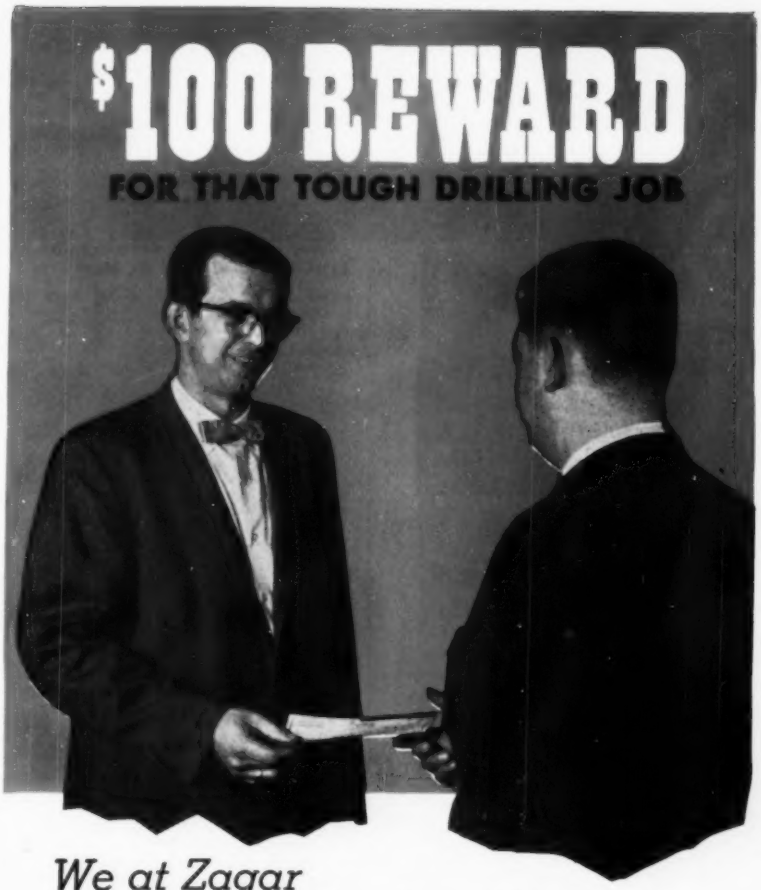
MORE DATA? Circle 86, inside back cover



Wall-Mounted Tensile Tester Saves Valuable Bench Space

Because bench space is often at a premium in test locations, the hydraulic cylinder and jaw units of this 3½-in. gage have been designed for wall mounting. The only bench space required is for the pump and integral reservoir base, and the manual pumping handle.

The stationary jaw holder can be adjusted for specimens from 5 to 13



We at Zagar
make the following offer:

We'll send you our check in the amount of $100 for every lead that materializes into an order for a drilling machine with these specifications:

1. Using 50 or more spindles at one pass.
2. Holes must be ½" diameter or larger.
3. Steel or other tough materials.

A hint to help locate such a job:

Plants and shops which use a large number of single-spindle drilling machines are logical prospects, because one Zagar multi-spindle drilling machine can drill up to 1500 holes at one pass.

Describe your job clearly for our Engineering Department to judge. *Please* include the coupon below.

SEND COUPON with Your Entry

Mr. FRANK G. ZAGAR, *President*
ZAGAR, Incorporated
24000 Lakeland Blvd., Cleveland 23, Ohio

Please consider the accompanying job for a "$100 reward".

Name, Title _____

Company _____

Address _____

_____

You never knew you could do so many things with MODERN ABRASIVES!

Say goodbye to many older, costlier metal working methods

TODAY, use Brightboy, the modern finishing medium that will perform many types of work previously unrelated with abrasive uses.

Brightboy's wide scope begins where conventional abrasives leave off. Its unique working action results from rubber and Silicon Carbide or Aluminum Oxide abrasive grains working simultaneously: BURRING, CLEANING, FINISHING, POLISHING, *in a single-step operation!* Readily available STOCK grains and textures are JOB-MATCHED to *your job!*

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- SAMPLE BRIGHTBOY HAND TABLET
- CATALOG LISTING GRAINS, TEXTURES, MACHINE SPEEDS
- NEW METHOD RECOMMENDATIONS

and for name of nearest Brightboy distributor

BRIGHTBOY INDUSTRIAL DIVISION
WELDON ROBERTS RUBBER CO.
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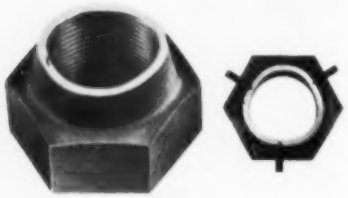
America's Pioneer Manufacturer of Rubber-Bonded Abrasives

WELDON ROBERTS
Brightboy
RUBBER CUSHIONED ABRASIVES

in. long. Breaking or yield point is indicated by a maximum-pointer hand that is carried along by the pressure hand on the gage. Models are available with capacities up to 40,000 lb.

Steel City Testing Machines, Inc, 8817 Lyndon Ave, Detroit 38, Mich

MORE DATA? Circle 87, inside back cover



Prevailing-Torque Locknut Has Pre-Lubricated Threads

Designated the Conelok-Nut, this simple one-piece reusable locknut obtains its locking characteristics by preforming the threads in the locking section. Three sectors of the tapered portion of the nut are preformed inwardly. When the nut is put on a bolt, these sectors are elastically returned to a circular shape and create an inward and downward pressure that brings the matching threads of the nut and bolt to bear tightly upon each other.

Conelok nuts are pre-lubricated to permit high speed power wrenching without galling.

National Machine Products Co, Utica, Mich

MORE DATA? Circle 88, inside back cover

Rapistan Table-Veyor Offered in New Model

Model 1050 is available in lengths from 5 to 60 ft in 2½-ft increments, and with belts from 4 to 24 in. in width. Spread of longitudinal bracing, which is bolted to cross bracing, is determined by width of belt and drive frame. Longitudinal bracing is always outside of the belt unit, giving full stability even when work tables are incorporated on one side only. Width of working area also can be changed along the length of the belt.

Mounted on stands which are adjustable to obtain correct working height, unit can be lagged to the floor for permanent installation or mounted on casters for portable use. Standard lengths are 5, 7½ and 10 ft, and bed widths range from 18 to 48 in. in 6-in. increments. Model, normally equipped with variable speed, can be furnished with fixed speed. Motors are available in ¼, ½, and ¾-hp ratings.

Rapids-Standard Co, 342 Rapistan Bldg, Grand Rapids 2, Mich

MORE DATA? Circle 89, inside back cover

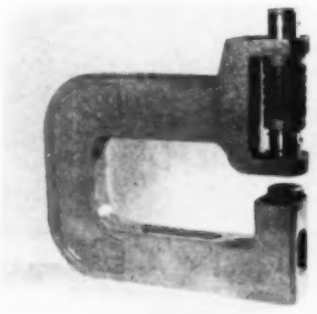
Instrument Checks Tolerance Accuracy of Surface Plates

Inspection instrument, called Tol-Check, checks the tolerance accuracy of any type or make of surface plate. It determines whether a surface plate is within the prescribed limits of accuracy by visually indicating on a dial any over-all deviations. Accurate evaluations can be made in 30 seconds.

Instrument is supplied with a master surface plate for standardization, durable case, and a hard, protective surface plate cover. It can also be supplied mounted on a rolling stand, making it ideal for routine plant inspection programs.

Herman Stone Co, 1860 N Gettysburg Ave, Dayton, Ohio

MORE DATA? Circle 90, inside back cover



Piercing Tools Punch Holes up to 1¼ in. in ¼-in.-Thick Stock

Designed for use in punchpresses and press brakes, the HP series of piercing tools is available in three different width models. Tools can punch

UNBELIEVABLE VALUES!

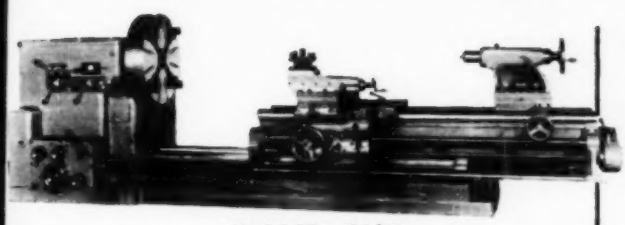
Available from stock!

THOUSANDS SOLD TO SATISFIED CUSTOMERS!

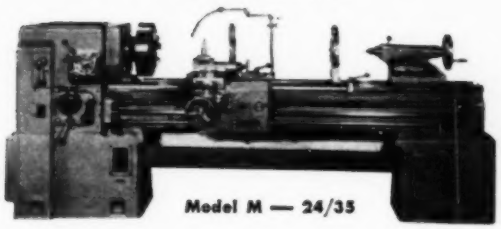
IMPERIAL PRECISION LATHES

FROM 12" SWING TO 200" SWING
30" CENTERS UP TO 300" CENTERS

EXTRAORDINARY PRECISION & QUALITY NEW MACHINERY



Model PS —34/62



Model M — 24/35

SCHAERER LATHE

- Swing from 20" to 44"
- Bed lengths to 35'

Available: concentric - non concentric copying attachments
- powered twin slides

Flame hardened, ground bed ways.
Heat-hardened gears throughout.
Precision roller spindle bearings.

Sizes in inches	Basic Price
12x40	$ 1393.
14x40	$ 1593.
16x40	$ 2084.
18x40	$ 3447.
20x40	$ 3647.
24x40	$ 8220.
31x40	$ 9790.
34/62 sliding bed x 60	$13790.
34x60	$11180.
45x57	$16980.
67x57	$21280.

Extra large holes through the spindles up to 13½"

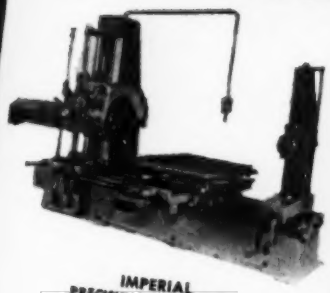
MISSILE LATHES swing up to 100

T LATHES up to 60" swing

FACING LATHES up to 200" swing

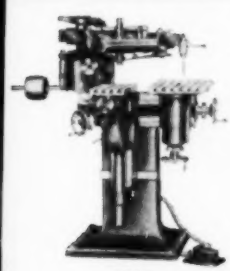
Many accessories available...Hydraulic Tracers, etc.

LIBERAL TERMS RENTAL PLANS



IMPERIAL PRECISION HORIZONTAL TURNING, BORING AND MILLING MACHINES FROM $9,988.

Size	Base Price
2⅜" Bar	$ 9988.
2¾" Bar	$11975.
3¼" Bar	$18880.
4" Bar	$29995.
5" Bar	$43880.
6¼" Bar	$47880.
8" Bar	$79850.



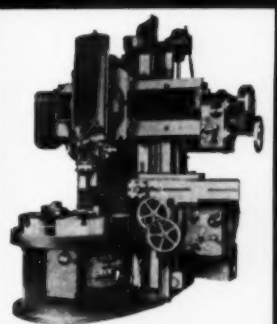
PEAR
3 DIMENSIONAL PANTOGRAPH ENGRAVER
Model PF/2
$2,985.

PEAR
2 DIMENSIONAL PANTOGRAPH ENGRAVER
Model CG/3
$1,695.

HAAS
UNIVERSAL TOOL & CUTTER GRINDER
$1,195

IMPERIAL
OPTICAL JIG BORER
$8,950.

PEDERSEN
UNIVERSAL TOOL & CUTTER GRINDER
Model U.S.L.
$2,795.



NILES- IMPERIAL
41"-51" Vertical Turret Lathe $24,985.

AARON MACHINERY CO., Inc.

Dept. A 45 CROSBY ST. NEW YORK 12, N.Y. • WA 5-8300

BRANCHES AT:
BUFFALO, N. Y. RICHMOND, CAL.
MINEOLA, N. Y. LOS ANGELES, CAL.
HOUSTON, TEXAS

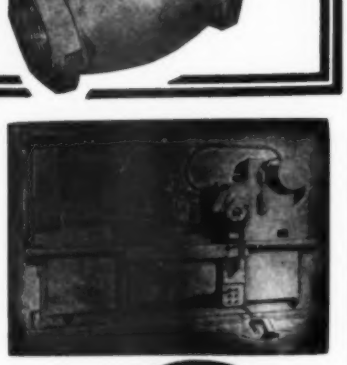
ALL ENDS OF PARTS
Completely Finished
"1·2·3"
ON THE
GOSS *and* DeLEEUW
Automatic Chucking Machine
in 1 SET-UP

This recent Goss & DeLeeuw development has already received universal acclaim as an outstanding achievement.

In speed, ease of tooling and precision finishing, the "1-2-3" chucker provides engineering advantages which result in vastly greater production at a fraction of parts' costs by other methods.

Easy, fast change-over from job to job makes this machine ideal for short-run requirements. Sturdy construction, power and speed make its advantages also apparent on long runs.

"1-2-3" means ability to handle work requiring machining operations on one, two or three ends simultaneously or in sequence — a method exclusive with Goss & DeLeeuw and offered on this machine.



Illustrated literature available promptly on request. Send samples of your work for time and cost estimates.

GOSS & DeLEEUW
QUALITY PRODUCT-QUANTITY PRODUCTION

GOSS *and* DE LEEUW
MACHINE COMPANY, *KENSINGTON, CONN., U.S.A.*

holes from 3/16 to 1¼ in. dia in stock up to ¼ in. thick. Shut-height is 8⅜ in.; die height is 3½ in.

The shoulder die is removable from the front without removing the punch from the setup. Disk stripping springs provide high initial pressure and uniform stripping pressure. The holder is designed to permit the piercing of angles close to the inside leg. Interchangeable punches and dies are available for all models.

Toolset, Inc, 1412 Military Rd, Buffalo 17, NY

MORE DATA? Circle 91, inside back cover

Drillpress speed reducer, designated the Slo-Speed Attachment, is now available for 20-in. Walker-Turner drillpresses having either No. 2 or 3 Morse Taper spindles (*AM*—Oct 6 '58, p136). Unit provides slow speeds for operations such as spotfacing, reaming, counterboring, core drilling, etc. Price: $68.75.

Rockwell Mfg Co, Walker-Turner Div, Dept 100, 400 N Lexington Ave, Pittsburgh 8, Penna

MORE DATA? Circle 92, inside back cover

Ceramic tool components, including a wide variety of bushings, washers, disks, plates, rods and V-blocks, can be used in high-temperature fixtures for brazing, soldering, sintering, welding, etc. Pieces are not affected by induction heating fields, nor will molten metal adhere to them. They are abrasion resistant and will not oxidize or warp under severe heating.

Duramic Products, Inc, 262-72 Mott St, New York 12, NY

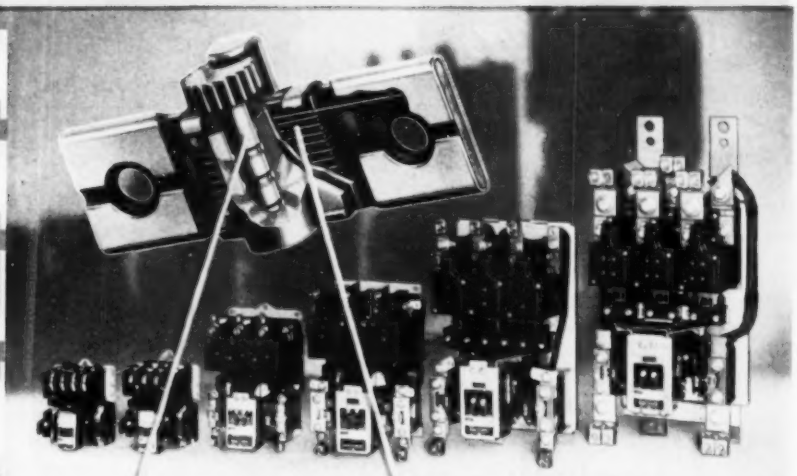
MORE DATA? Circle 93, inside back cover

"Automatic, my eye! You still have to press a button to turn it on, don't you?"

When you buy Motor Starters——

YOU PAY FOR OVERLOAD PROTECTION

...BE SURE YOU GET IT!



Heat-responsive element (solder pot) provides accurate response to overload, yet prevents nuisance tripping.

Heat-producing element is an integral part of overload unit. It's permanently joined to solder pot, can't become misaligned.

Only ONE-PIECE Overload Relays can give 100% Protection Only with ONE-PIECE construction can you *know* you've installed the heater correctly. Only with ONE-PIECE construction can you *know* the heater is exactly centered, or properly positioned, so that it performs according to its rating. Only with ONE-PIECE construction can you *know* your starters will not operate without the thermal units properly installed. Only with ONE-PIECE construction can you *know* your motors have full protection.

Only Square D has ONE-PIECE Construction ONE-PIECE construction *eliminates* any possibility of heater misalignment. Square D melting alloy thermal overload relays can be installed only one way. They are tamper-proof. They are factory-assembled, are *individually* calibrated and tested. Repeated tripping will not affect their accuracy.

Insist on Square D starters with melting alloy thermal overload relays

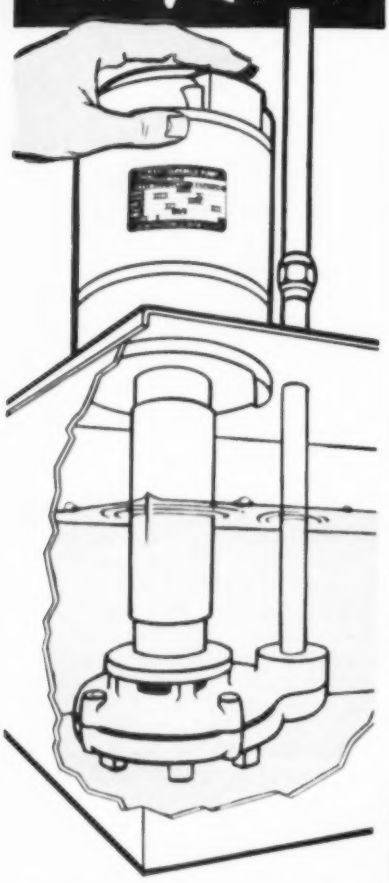
LET US PROVE IT!

Let your Square D Field Engineer show you 1 how one-piece construction is accomplished and how easy it is to mismatch separate heaters and solder pots— 2 an endurance tester to prove that overload units can be reset repeatedly without damage while the solder is liquid— 3 a tripping time tester to compare various types of melting alloy units and to prove that tripping time won't change after repeated operation.

Write for Bulletin SM-275 for the complete story on Square D starters with ONE-PIECE thermal overload relays. Address Square D Company, 4041 N. Richards St., Milwaukee 12, Wisconsin

SQUARE D COMPANY

put a GRAYMILLS COOLANT PUMP on that machine and *Relax*



You'll get smooth, quiet performance, abundant volume, year after year, at less cost. They're dependable, abrasive proof, need practically *no* service. Interchangeable, Standard NEMA motors (also JIC Models).

Coolant pump shown is Model 33JL ¼ H.P. Get it from your Industrial Distributor.

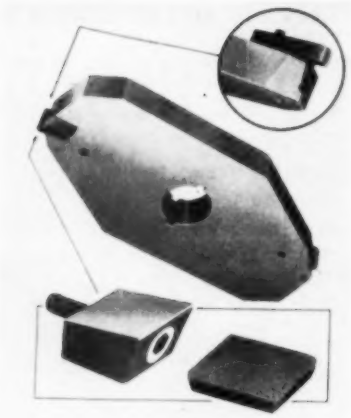
WRITE FOR THIS NEW FREE CATALOG

Showing standard and JIC Model centrifugal and gear type 1 25 to 2 H.P. Pumps, Pumping Units, Accessories and helpful selection chart.

156

GRAYMILLS GRAY-MILLS **CORPORATION**

3707 N. LINCOLN AVE.
CHICAGO 13, ILLINOIS



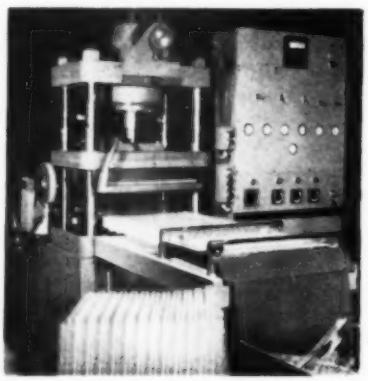
Positive-Rake Fly Cutter Has Solid-Carbide Indexable Blades

This two-station, positive-rake fly cutter is designed for skin and spar milling applications, particularly for aluminum forgings and castings. Width of cut is accurately controlled by a simple blade setting gage that locks on the side of the cutter, permitting operator to set blades in exact position without removing cutter from spindle or disturbing the setup.

The cutter is dynamically balanced and does not require rebalancing after indexing or replacing the blades. Wedge holding power has a safety factor of 300%, based on a 14-in.-dia cutter at 3600 rpm.

Futurmill, Inc, 6360 Highland Rd, Pontiac, Mich

MORE DATA? Circle 94, inside back cover



Automatic Pressure-Vac Speeds Plastic Forming

Model 2428 Pressure-Vac machine is designed for high-speed, lowcost, precision production forming of oriented styrene, Mylar, linear polyethylene, nylon, and other plastics with superior physical properties.

Unit, using a force of 60 tons, forms 28 sq ft of molded plastic per minute to exceptionally close tolerances with high detail, according to manufacturer. Forming area is 23 x 28 in. with a mold depth to 6 in. Materials from ¼ mil to 250 mil thickness may be used with the machine.

Auto-Vac Co, Div of National Tool Co, 1984 State St Extension, Bridgeport, Conn

MORE DATA? Circle 95, inside back cover

Rotary Head Milling Attachment Fits Horizontal Vertical Millers

Designed for use on horizontal or vertical milling machines, this rotary head attachment offers six speeds through a V-belt drive from a ½-hp, 1200-rpm motor. A double rotary worm shaft provides for both smooth, exacting rotation and fast head rotation. The unit rotates 360° in either direction; the cross-slide adjustment offsets the spindle up to 3⅝ in.

Other features include adjustable limit stops, fast-action spindle lock, rotary degree scale, and cross-slide scale.

Everede Tool Co, 2000 N Parkside Ave, Chicago 39, Ill

MORE DATA? Circle 96, inside back cover

Reliance Electric Announces Line Of Machine Tool Tracer Drives

This line of electronic tracer drives, called Reliance V-S tracer drives, is available with single-axis, dual-axis, or full two-axis travel. Each drive unit consists of a tracing templet follower; an operator's station; a packaged, cabinet-mounted con-

LEDLOY*

Free Machining Steels for Forgings

LEDLOY

METALWORKING SHOPS FIND LEDLOY* STEEL FORGINGS SAVE TIME . . . TOOLS . . . FINISHED PART COSTS!

Metalworking shops in ever increasing number are specifying *Ledloy* steels in forgings. The trend started when it was found that forged parts made with *Ledloy* steels resulted in savings far surpassing the original higher cost of the forging. *Ledloy* is widely known as Inland Steel Company's trade name for any grade of steel to which lead has been added to obtain greater machinability. Forgings made from *Ledloy* steels can be heat treated and forged in exactly the same manner as similar non-leaded grades of open hearth steels, while machinability is increased up to 50% in many applications.

Thus, regardless of grade of steel in use currently for your product, if machining is an important part of the fabricating process, the experience of hundreds of metalworking plants has proven that a change to a similar *Ledloy* grade can definitely cut total machining cost in many cases.

cost-cutting factors:

Increased machinability, higher speeds and feeds, easier tolerance control, reduced tool wear, less down-time, greater production per tool change and fewer finishing operations.

Although it is well known that *Ledloy* Grade A can be machined 45% faster than B1113 and *Ledloy* Grade B 100% faster than B1112, it is not as widely realized that forgings made of *Ledloy* steels can show similar startling results. If present equipment is not being run at highest potential speeds, considerable savings can result using *Ledloy* grades and taking advantage of their much greater machining rate. Surface speeds of 325 feet per min. are common and much higher speeds are possible—up to 450 sfm with high speed tools and up to 600 sfm with carbide tooling when using Grade A *Ledloy* steel.

If current operations wear tools excessively, necessitating frequent tool changes, or if tooling cost is relatively high, *Ledloy* steels can effect significant savings. Because the Inland process of adding lead to steel lowers the steel's frictional component, less heat is generated during machining. *Ledloy* steel's shorter-length chips quickly fall clear of the tools, and tool-edge build-up is minimized. The end result, clearly discernable, is far greater production, less down-time for tool changes and a welcome reduction in total machining cost. *Ledloy* steel's lubricating and better-chip-forming qualities make it the fastest machining steel in the world. The superior surface finish obtainable with leaded steels can often result in the elimination of one or more subsequent finishing operations.

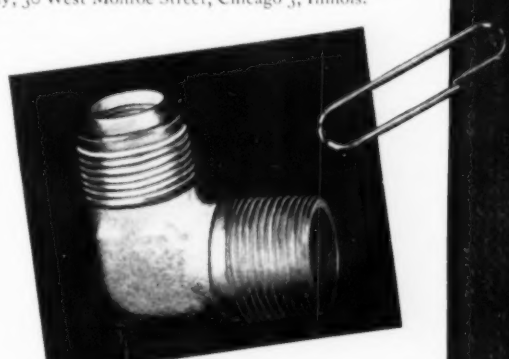
characteristics:

Inland regularly produces *Ledloy* free-machining open hearth steels to a wide variety of chemical specifications to meet customer requirements. In each instance, regardless of chemical composition, *the addition of lead by the Inland process results in no significant change in the desirable mechanical and metallurgical characteristics of the steel.* All the important qualities of open hearth steels such as ductility, impact values, transverse strength, case hardening qualities and cross sectional soundness, are fully retained. *The only thing changed is the machining characteristic which is vastly improved.*

availabilities:

Inland *Ledloy* free-machining steels are available in a wide range of standard carbon and alloy grades in bar form or plates. In forgings, the increase in machinability is every bit as good as that obtained in bar stock steel and finish is superior.

If your product requires machining, it will pay you to investigate the potential savings offered by Inland *Ledloy*—the original leaded steels. Ask your Cold Drawer or Steel Service Center about Inland leaded steels, today. They are offered as *Ledloy* or under other brand names. For the very informative booklet, "Properties of Inland Ledloy Steels," write to Inland Steel Company, 30 West Monroe Street, Chicago 3, Illinois.



A switch to Ledloy Grade A in these forged fittings permitted a 27% increase in machinability.

INLAND STEEL INLAND **LEDLOY STEELS**

the world's most machinable

*Reg. Trade Mark

FEEDCISION

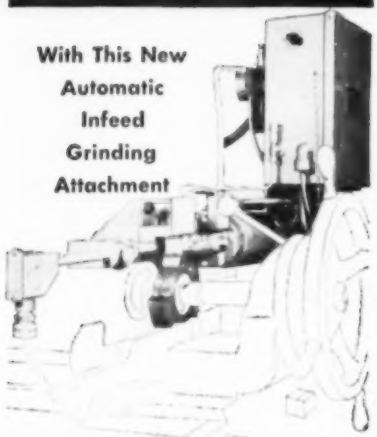
INCREASES CENTERLESS GRINDING PRODUCTION

200%

YES

300%

With This New Automatic Infeed Grinding Attachment



Utmost precision in grinding and duplicate sizing. Sizing dial is graduated in (.00001) one hundredth of a thousandth of an inch. No hydraulic checking cylinder to change feed rate when oil is cold. No checking of oil level or refilling of hydraulic checking cylinder. Three (3) different feed rates are available in one unit for the fastest, most efficient, and precise sizing in a centerless grinder.

CAN BE USED FOR TRU-FEED AS WELL AS INFEED for close sizing. Ideally located push button control station consists of Stop-Button, Caution Pilot Light, and a selector switch for set up or auto grinding positions. **CATALOG** — Write for it today!

MODERN DEVICES

Subsidiary of

TWENTIETH CENTURY MFG. CO.

Box 429 A Libertyville, Illinois

Open Territories for Manufacturers' Representatives

trol unit; and controlled variable-speed dc feed motors.

Depending upon the condition of the machine upon which the drive is mounted—the amount of backlash, or the condition of the leadscrew—repetitive accuracy of up to 0.0015 in. can be expected.

The drive is so arranged that the machine can be used manually if desired. In operation the drive produces a constant feed rate, regardless of the contour of the templet.

Reliance Electric and Engineering Co, 24701 Euclid Ave, Cleveland 17, Ohio

MORE DATA? Circle 97, inside back cover

Adjustable Speed Drive Available in Ratings of ¾ to 7½ hp

Designed to supply precise operating speeds for machine tools, process machinery, conveyors, and similar equipment, the Ajusto-Spede drive is available in ratings of ¾ to 7½ hp with a stationary field construction. It is suitable for continuous operation at full load (constant torque) in ranges as high as 34:1 and for intermittent use from zero to full speed.

An ac motor drives a clutch drum at constant speed while speed on the clutch spider (output member) is adjusted by varying dc excitation to the clutch coil. Direct current is supplied by a small controller. Fingertip command of drive operations is concentrated in a separate operator's station.

A tachometer feedback circuit continually and automatically corrects speed as required. Jogging (or inching) control is a standard feature; many optional control features can be provided.

Louis Allis Co, 427 E Stewart St, Milwaukee 1, Wis

MORE DATA? Circle 98, inside back cover

MARKING METAL?

Blaisdell markers do the trick

CHINA-MARKER

Unsurpassed for bold, bright marking on all surfaces. Strong and durable—adheres firmly—14 vivid colors.

OMNIMARK—Thinner diameter lead for fine line marking.

DU-ALL
MECHANICAL PENCIL

Convenient propel-repel action. 8 brilliant, all purpose leads with barrels to match.

AT BETTER STATIONERS EVERYWHERE

Test the marker that suits your needs. Send for sample naming this publication.

blaisdell

PENCIL COMPANY

BETHAYRES, PA.

CIRCLE 268 READER SERVICE CARD

CIRCLE 269 READER SERVICE CARD

Comparative tests prove *Norgren* AIR LINE FILTERS SAVE MAINTENANCE TIME

MAKE	NORGREN	A	B	C	D	E
LOOSE PARTS TO DISASSEMBLE	4	9	16	13	6	12
TOOLS REQUIRED FOR MAINTENANCE	NONE	Wrench	Wrench & Screw-driver	Screw-driver	Wrench	Wrench & Pliers
TOOL OPERATIONS REQUIRED	NONE	2	10	16	2	4

No Tools Required... Fewer Parts to Handle

Compare Norgren with other makes of manual drain filters. All others require tools to take them apart ...then there are a dozen or so loose parts—easily dropped and lost, and likely to be improperly reassembled. Not so with Norgren Filters. No tools are needed for maintenance and there are only four parts to reassemble. Maintenance is simple... an easy job for anyone. This means a big saving in maintenance time and money.

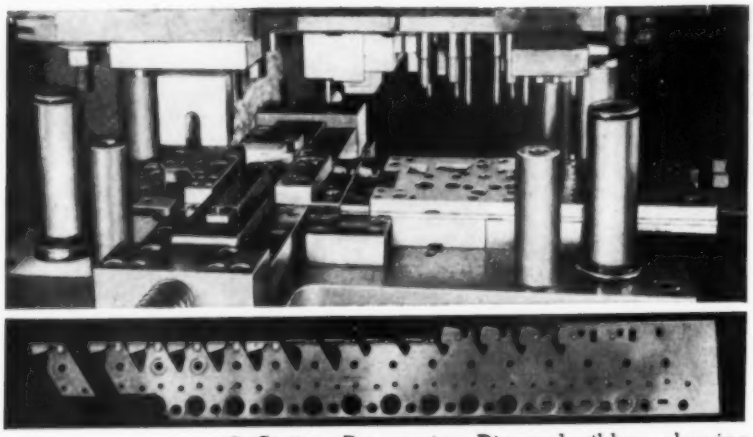
Norgren Filters Provide Top Performance in removing damaging solids and liquids from an air line. Transparent or metal bowls. ¼", ⅜", ½", ¾", 1" pipe sizes.

If it's Norgren...It's Dependable.

For complete information, call your nearby Norgren Representative—or WRITE FOR DESCRIPTIVE LITERATURE

C. A. NORGREN CO.

3436 SO. ELATI STREET • ENGLEWOOD, COLORADO



9 Station Progressive Die and ribbon showing can opener blade ready for assembly as it comes from die. Production: 70 pieces per minute.

HOW B. Jahn PROGRESSIVE DIES MAKE

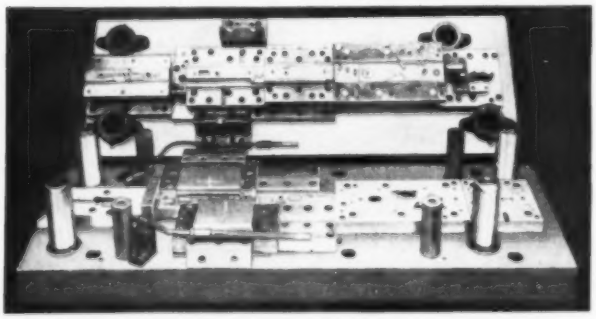
CAN OPENER COMPONENTS BY THE MILLIONS!

Components for can openers are mass produced—high production—close tolerances. Expense for down time can't be tolerated. Production methods must be flawless to protect profits.

That's why this successful can opener manufacturer left the **die design and production** responsibilities to B. Jahn.

You too can eliminate production operations, conserve raw material, save valuable hours, improve profits with B. Jahn Dies.

6 Station Progressive Die produces 2 completed can opener handles, right and left, at each press stroke. Production: 140 pieces per minute.



B. Jahn

Send for B. Jahn Brochure Today —

THE B. JAHN MANUFACTURING COMPANY, NEW BRITAIN, CONNECTICUT

FIELD REPORT...

Roto-Finish Buys Ransohoff

Two of the oldest companies manufacturing machinery for the surface treatment of metals have combined forces. Roto-Finish Co, Kalamazoo, Mich, maker of precision barrel finishing equipment, has purchased Ransohoff, Inc, Hamilton, Ohio, manufacturer of metal finishing, phosphating, pickling, and paint finishing systems. Acquisition will provide engineering and manufacturing facilities for a complete line of metal treating machinery.

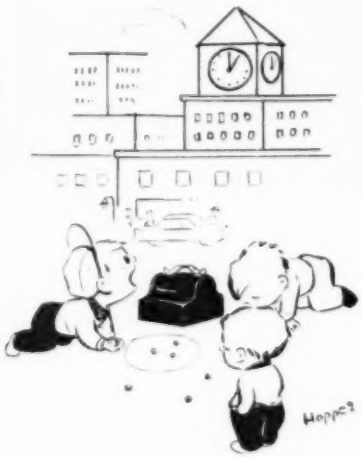
Rudel to Handle Sidney Lathes

Sidney Machine Tool Co, Sidney, Ohio, has appointed Rudel Machinery Co, one of the three largest distributors of machine tools in the US, as distributors for its entire line of heavy-duty engine lathes, toolroom lathes, and tracer-controlled and special lathes for all of New England and northern New York.

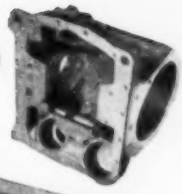
$58 Million Contract to Garrett

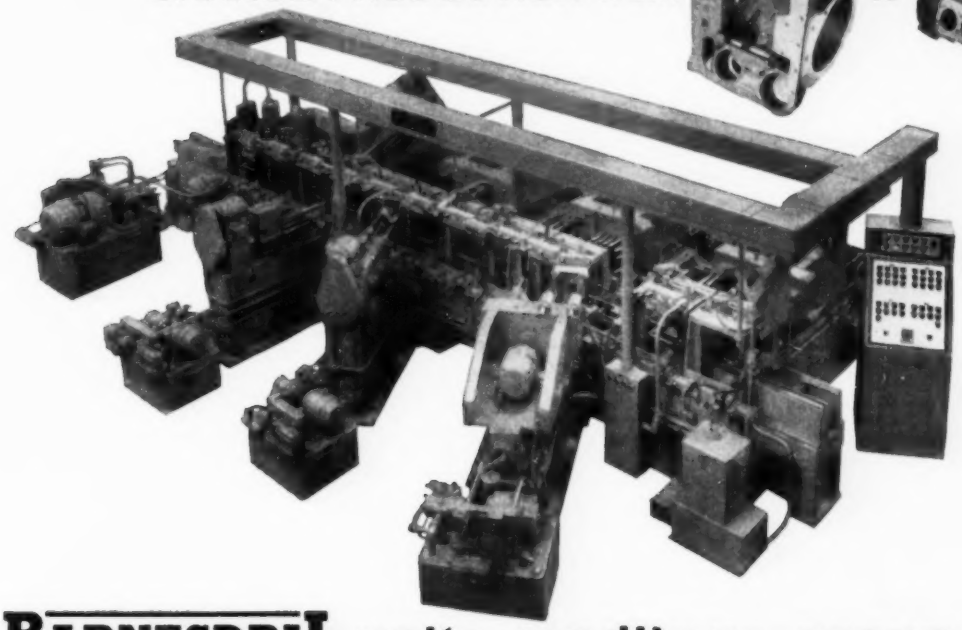
Garrett Corp, Los Angeles, has a $58 million-plus order from North American Aviation to develop and manufacture central air data computing systems for the AF F-108 interceptor being built by North American. Contract will take about 5½ years to complete, and up to half of the manufacturing program will be subcontracted by Garrett to other firms.

(continued on page 159)



"One o'clock! Well, no use taking my dad's lunch down to the shop now—lunch hour is over!"

CHANGE PRODUCTION from  to



BARNESDRIL units readily re-group or modify for new production needs

Here's how existing machines may be changed to handle new production problems.

- Modify auxiliary heads on existing machines.
- Use existing center section, modify or add new units.
- Adapt new center section, modify and/or add new units.
- Use idle equipment and group around existing or new center section.
- Use existing units, move from facility to facility, and adapt to required production.

Diagram shows Barnesdril transfer machine as modified, original machine in white, with changes and additions in gray.

Barnesdril engineers have been building production unit-type machines since 1937. Many of these original machines have been re-grouped or modified several times, effecting tax savings and reducing capital investment requirements. If you have product changes at the present time, or want to change-over to new operations, ask Barnesdril engineers to show you how existing machines can be effectively utilized, with savings up to 20% over new machinery costs.

New Bulletin

Contains Complete Story On Barnesdril Units. Write For Free Copy.

BARNES DRILL CO.

830 CHESTNUT STREET • ROCKFORD, ILLINOIS

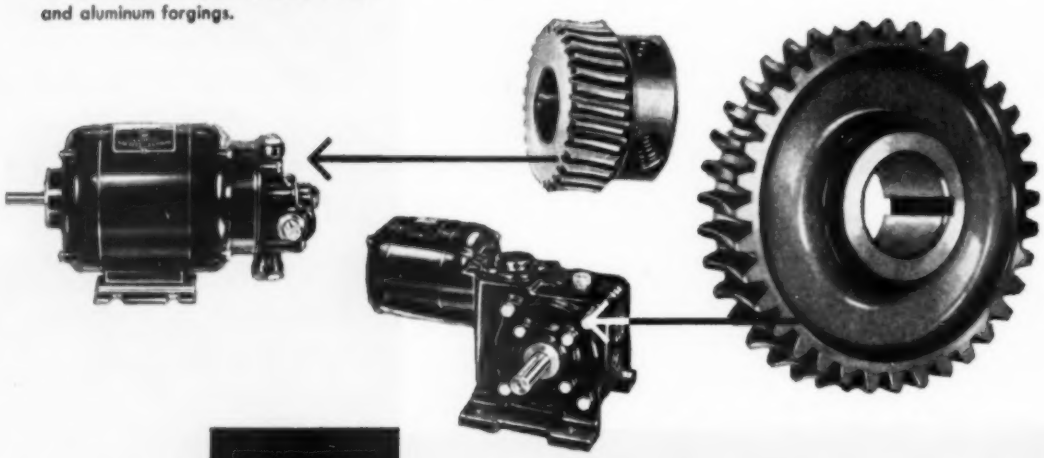
DETROIT OFFICE: 13121 Puritan Avenue

MUELLER BRASS CO. forged gears improve dependability and performance of BODINE electric motors

For combined high shear strength and maximum wear life in their single and double reduction speed reducer motors, Bodine Electric Company of Chicago uses gears forged from Mueller Brass Co. 603 Alloy.

Bodine has specified Mueller Brass Co. forged gear blanks because of their consistently high quality . . . there is no porosity, foreign inclusions or defects typical of cast blanks. The hot working of the metal followed by heat treatment to the desired physical properties produces a refined grain structure to give uniform machining and wear in service. The forged blanks are consistent in size and held to close tolerances. Bodine has also found that the excellent machinability of the blanks in the hobbing operation increases overall hob life.

For forgings of high tensile strength, high density, minimum porosity, light weight, corrosion resistance, good machinability and low costs with little scrap loss, it pays to specify forgings from the Mueller Brass Co., the world's largest producer of brass, bronze and aluminum forgings.



only the man from Mueller Brass Co.

can offer unbiased advice on the "one best way" of producing your parts, because Mueller Brass Co. is the *only* fabricator in the country offering all these methods of production . . . assuring you the best product at the best price . . . made the one best way.

Write today for complete catalogs on any of these products.

FORMED COPPER TUBE

PLASTICS INJECTION MOLDING

COLD-PREST IMPACT EXTRUSIONS

SCREW MACHINE PRODUCTS

POWDER METAL PARTS

RED BRASS CASTINGS

Also producers of: Super Cutting Red Tip Brass Rod • Aluminum Extrusions Aluminum Sheet, Coil and Strip • Plastic Pipe and Fittings • Copper Tube and Solder Type Fittings •

MUELLER BRASS CO. PORT HURON 24, MICHIGAN

242

Field Report . . .

Honeywell Introduces Medium-Scale Computer

Minneapolis-Honeywell Regulator Co has developed a medium-scale computer with a new transistorized system called the Honeywell 800 that can do data-processing and scientific computation simultaneously at lightning speeds. Ability, called automatic parallel processing, enables the system's central processor to perform up to eight separate, independent jobs at the same time, in contrast to the one-at-a-time abilities of conventional systems. First deliveries of the 800, produced at the Datamatic Division plant in Boston, are scheduled for the third quarter of next year. Rental will range upwards from $11,000 a month for the minimum system. It'll require about one-tenth the floor space required by a comparable non-transistorized unit and will use about one-tenth the power.

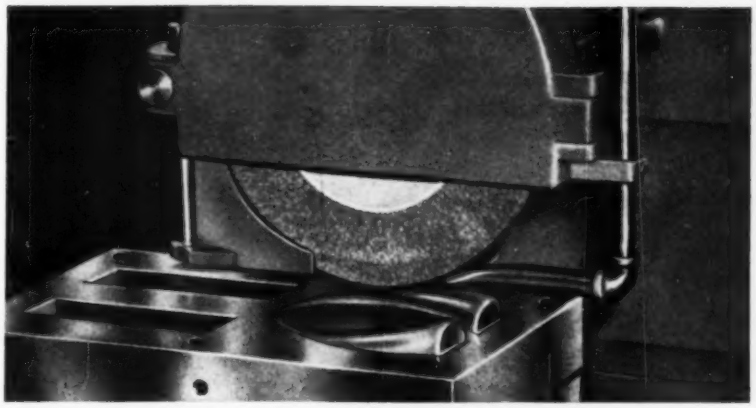
$23 Million Order to Martin

Martin Co, Baltimore, has a $23 million Navy contract for continued production of the 250-mph Marlin seaplane which will carry a new submarine detection system. Number of planes in new order was undisclosed.

Philadelphia Naval Shipyard Gets $19 Million Business

Shipyard will work on a $19 million Navy reconversion project. A landing ship dock of the Ashland class will be berthed at the yard next fall to be converted into a seaplane tend-

"Of course your 30 years of experience is in your favor . . . but the 30 years you spent getting it is against you!"

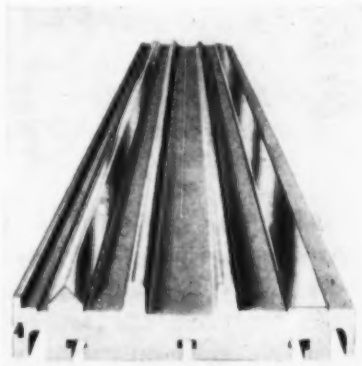


Micro-precision extended for years
ON EVERY COVEL TOOL-ROOM SURFACE GRINDER

Grinding plastic mold dies like this calls for MICRO-PRECISION . . . and the 14" x 24" Covel "60" has it! Also accurately grinds trim, forming, blanking and die-casting dies in addition to jigs, fixtures, dovetail and flat form tools. Ideal for high speed or carbide production parts grinding, too. Covel precision grinders save you money because they give new-machine performance longer—stay "front-and-center" in your tool-room grinder lineup for years and years of MICRO-PRECISION performance. That's because Covel-pioneered features preserve new-machine accuracy longer—for example, hard chrome table ways maintain built-in accuracy far beyond the life of ordinary ways. Before you buy your next surface grinder, it will pay you to learn all the facts about this and other Covel advances.

***First* with hard chrome table ways**

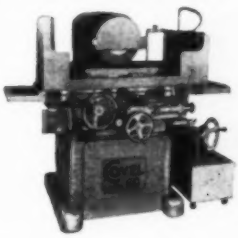
A special plating process developed by Covel applies a hard chrome surface to hand-scraped Vee and flat table ways insuring long-lived accuracy. Many Covel chrome plated ways have been in service for ten years and more without noticeable wear and without a sign of flaking.



Why Covel outperforms other tool-room surface grinders

Hydraulic rapid traverse with 15" cross feed, power elevation and high speed make the Covel "60" able to outperform machines costing much more. Elevating hand wheel is *below* table level and all controls are grouped for easy operation. Optional hydraulic wheel truing device automatically provides a truer grinding surface. *Write for catalog today.*

Micro-Precision a Covel Tradition-Since 1874



Send today for your copy of "The Covel Precision Story" and complete data on the Covel Surface Grinder that meets your needs — seven sizes from 6" x 12" to 16" x 36". Ask for Bulletin AM-39

COVEL PRECISION GRINDERS
BENTON HARBOR, MICHIGAN

CIRCLE 274 READER SERVICE CARD

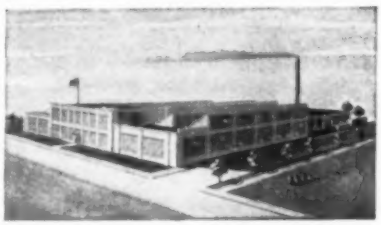
Here's how CDT can help you

CDT CAN INCREASE YOUR PRODUCTION
. . . because CDT specializes in designing and building tools and machines for today's high production demands.

CDT CAN IMPROVE YOUR QUALITY
. . . because CDT tools, jigs, fixtures and machines are precision engineered and built to the strictest requirements.

CDT CAN LOWER YOUR PRODUCTION COSTS
. . . by increasing the efficiency of your operation with special tools that do the job better—faster—more economically.

Call on Columbus Die-Tool for your special tooling problems. A large creative engineering staff with experience in developing special tools and machines for hundreds of industries is at your service. Over 50,000 square feet filled with precision production equipment enables us to build fine tools and special purpose machines to exacting requirements. Avail yourself of the industry-wide experience of Columbus Die-Tool.



FREE: *New brochure listing facilities, equipment, etc. Write today.*

Columbus Die-Tool
AND MACHINE COMPANY
P.O. BOX 750 • COLUMBUS, OHIO
ESTABLISHED 1906

Designers and manufacturers of JIGS • FIXTURES • SPECIAL TOOLS • UNITS FOR MACHINE TOOLS • *also Builders of Machine Tools Complete*

Field Report . . .

er. When completed, the tender will service large jet-powered seaplanes such as the Seamaster, now being produced by Martin Co, Baltimore. The Philadelphia yard is currently converting a tender, the Currituck, and will complete the job this year. No estimate of workers or of man hours involved on the new job has been disclosed.

Ryerson Steel . . .

. . . has added Reynolds aluminum to stocks carried at its Cleveland plant. New aluminum stocks include rod, bar, plate, flat sheet, tubing, pipe, and structural and extruded shapes

Burroughs Expands for SAGE Work

Burroughs Corp is stepping up production of computers for the SAGE continental defense program by 50%. Company is taking over two plants adjacent to its Dearborn, Mich, facility and will renovate them, adding 87,000 sq ft of floor space to the present 220,000. Present workforce of 2300 will be enlarged by 400 new employees.

Plant also produces guidance systems for the Atlas missile. Total contract awards for the SAGE program to date add up to $122 million and for the Atlas program, $102 million.

Hirschmann Acquires Sales Rights To Coil Winding Equipment Line

Carl Hirschmann Co, Manhasset, NY, will handle sales and service of the entire line of Micafil equipment. This includes automatic winding machinery for multi-layered magnetic coils

"I need about two inches of bar stock."

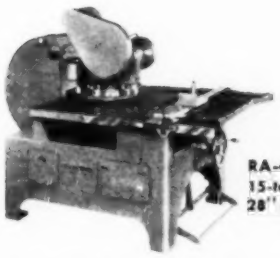
"CAN I GET 10 MORE TODAY?"

"Sure . . . with our WIEDEMANN"

From one of a kind to a thousand or more pieces . . . from a single hole to hundreds of openings of many sizes and shapes — rounds, rectangles, groups, louvers, notches, knockouts, etc. — you'll pierce your work faster and cheaper on a Wiedemann Turret Punch Press. The Wiedemann Method eliminates layout and setup. Savings of 60% to 90% are commonplace. That's why production men who know the difference invariably say "Run em on a Wiedemann," and why every job shop *must* have a Wiedemann section.

Job shop fabricators & manufacturers . . . discover the profitable difference a Wiedemann will make for you. Write today for Bulletin 301 — and send drawings of your work for free time study.

12 to 32 Punches and Dies Ready for Use



RA-41P Wiedemann
15-ton capacity
28" throat depth

Other models from 4 to 150 tons

WIEDEMANN
MACHINE COMPANY
TURRET PUNCH PRESSES

DEPT. AM-2 • GULPH ROAD • KING OF PRUSSIA, PA.

CIRCLE 276 READER SERVICE CARD

let Ingersoll HYDROSPIN your parts

If the shape of your part is tubular, conical, hemispherical, or curvilinear, hydrospinning by the Ingersoll Kalamazoo Division may save you costly machining expense and time. If you want a seamless part, try hydrospinning. If you want precise wall thickness, turn to hydrospinning. Hydrospinning saves on metal, time and labor.

COMPLETE PRODUCTION FACILITIES

Ingersoll Kalamazoo Division has an experienced engineering staff, and complete hydrospinning equipment. If you have a metal forming problem where hydrospinning may be of help to you, send an outline of your problem or contact the Defense Sales Dept. of

Borg-Warner Corporation

ENGINEERING B-W PRODUCTION INGERSOLL KALAMAZOO DIVISION

1810 N. Pitcher St. • Kalamazoo, Michigan

Field Report . . .

with or without interleaved insulation, universal wound coils, bobbins, solenoids, precision resistors, armature and stator windings, and toroidal cores. Hirschmann servicemen have completed Micafil factory training courses; machines will be displayed at the IRE show in March.

McDonnell Lays Off 1000 Because of AF Stretchout

McDonnell Aircraft Corp has furloughed 1000 production and office workers following an Air Force decision to stretch out deliveries of the company's F-101B Voodoo supersonic interceptor aircraft. Layoff reduces employment to 25,800 at the facilities adjacent to St Louis Municipal Airport. Stretchout order, cutting top rate of monthly F-101B production to 20 from 25, extends deliveries to December 1960 from the previously scheduled delivery date of August 1960 for the last plane. No order cancellations were involved.

Calumet & Hecla Co . . .

. . . has teamed up with Brooks & Perkins Co (both of Detroit) in construction of the first unit of a new magnesium metal plant at Selma, Ala. The $4.5 million facility is expected to go into operation next December. Plans also call for construction within three years of a second unit to cost $3 million. Calumet's Wolverine Tube plant at Decatur, Ala, is set to increase its production this year by 11%. Facility employs 800 and is the South's major producer of copper and copper base alloy seamless tube. It also turns out aluminum tubing and extruded aluminum shapes.

Packard Bell Electronics . . .

. . . Los Angeles, has two Navy contracts totalling $5 million for production of advanced equipment for the Douglas A4D Skyhawks and the Chance Vought F8U Crusaders, two first-line Navy aircraft.

Northwest Orient Lines Places Order at Lockheed

NOL has given Lockheed a $29.6 million order for 10 propjet Electras and spares, plus a major order for five DC-8 jets. The DC-8s are for use on the line's transPacific operation and the Electras will be used for transcontinental runs. First deliveries of the Electra are scheduled for July and will continue through December.

H K Porter Division Expanding Alabama Steel Mill

Connors Steel Division, headquartered at Alabama, is starting a half-million-dollar modernization of its facilities there. Expansion includes construction of a pouring building with a 25-ton crane, and installation of pouring car equipment. New facilities will allow operation of all three of Connors' electric furnaces simultaneously. Target date for completion is early May. This is the second mill expansion in three years for the division. The $2.5 million renovation completed late in 1956 netted an increase in annual ingot tons of approximately 24%. Construction of a cold drawn bar mill made Connors the only producer of this product in the South.

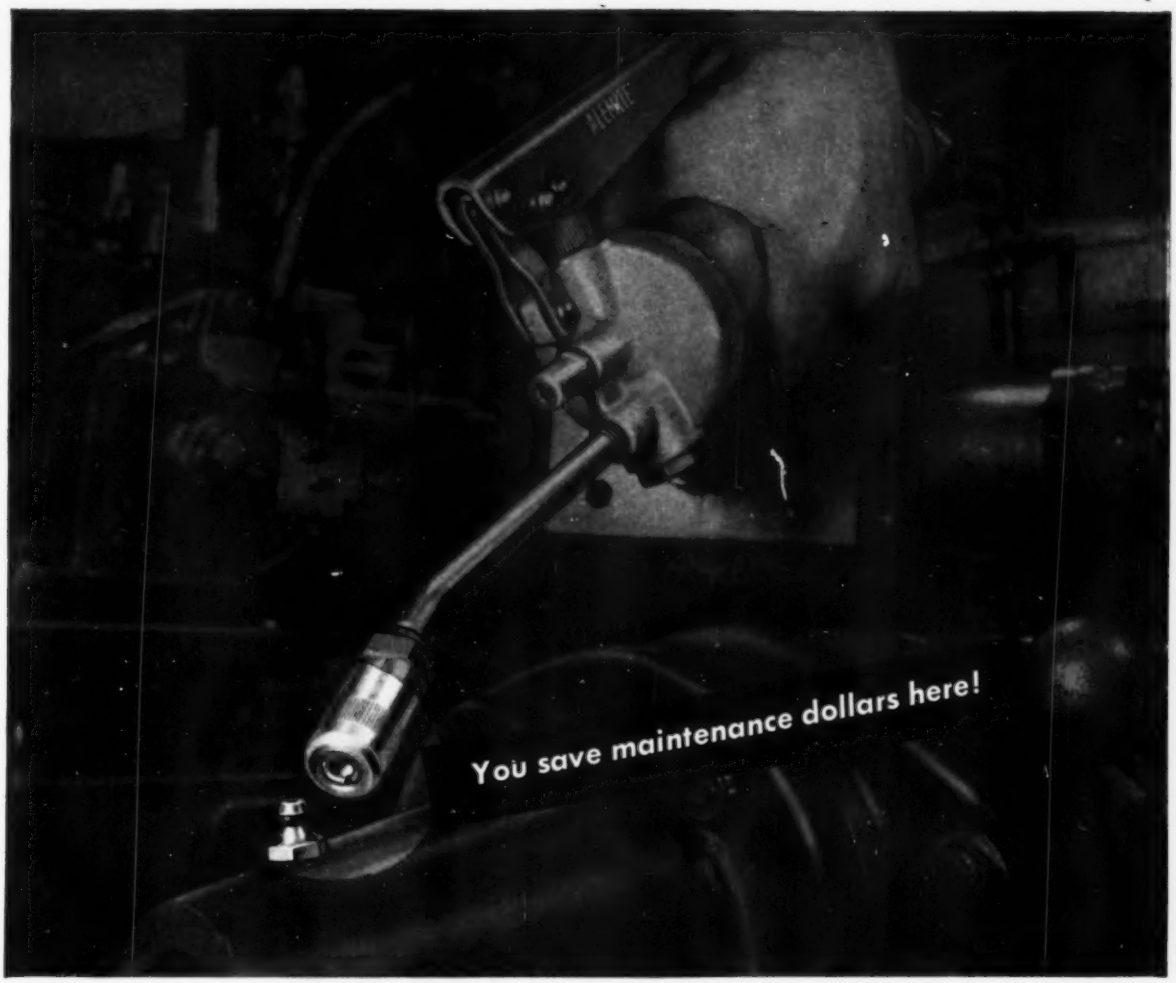
US Steel Streamlining LA Division

An 18-month modernization program at the Steel Products Division is underway. Existing wooden buildings covering 50,000 sq ft of factory space will be replaced with new steel structures, and 60,000 sq ft of production area will be added. Plant layout and production lines will be adapted to new surroundings.

$7 Million Diesel Contract Goes to Cooper-Bessemer

Order for 119 of its latest design turbo-charged locomotive diesel engines is the largest single order for locomotive engines to be received by the company. Purchased by the locomotive and car equipment division of

"He's writing to the President—thinks a foreman has too much power for any one man."



Alemite Hand Guns and Fittings Give You Up to 10,000 lbs. of Lubrication Power!

The point of lubrication is where maintenance costs can be cut—providing you have the right equipment for the job!

This heavy-duty Alemite hand gun—combined with genuine Alemite lubrication fittings—brings up to 10,000 lbs. of pressure to even ordinary lubrication points. It gives you power to spare for fast, efficient, money-saving protection of every machine in your plant!

Gun handles all regular pressure gun greases. Long operating handle for maximum leverage. Loader fitting permits fast, clean filling (or gun may be filled by suction). Heavy steel linkage for true piston alignment. Capacity, 1 lb. Get more out of man-hours and machine-hours with Alemite lubrication equipment!

Symbol of SW Excellency

ALEMITE
DIVISION
STEWART-WARNER
CORPORATION

1850 Diversey Parkway, Chicago 14, Illinois

—MAIL COUPON FOR COMPLETE INFORMATION—

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Please send me free your complete catalog of Alemite industrial lubrication equipment

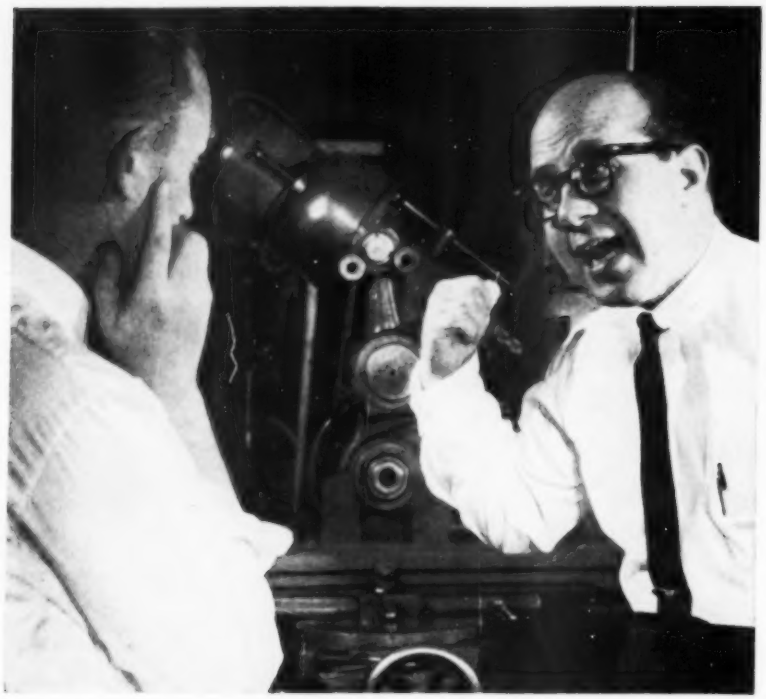
Name .....

Company .....

City ..... State .....

CIRCLE 278 READER SERVICE CARD

TORIT DUST COLLECTION ENDS THIS:

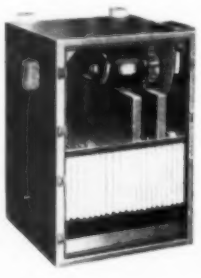


"OUT OF PRODUCTION FOR THREE DAYS? THAT'S WHEN WE'RE SUPPOSED TO SHIP!"

"And believe me, that wasn't all the boss said! Two key machines were so clogged with dirt and grime we had to disassemble and clean them—overnight! Between overtime for the repair crew and our own crew, I managed a partial shipment in three days. And I made up my mind this wasn't going to happen again!

"I'd heard of preventive maintenance with Torit Dust Control equipment—and the Torit representative I called sure opened my eyes! Clean machines hold close tolerances better and up to 80% longer! Torit collectors remove over 99% of dust and air-borne debris, save on both the cost and frequency of servicing.

"I expected there'd be a hitch on prices—but look what I found out: our production breakdown cost nearly as much as the Torit equipment we needed! And just while Torit Dust Collectors are being depreciated we'll make money on them—through maintenance savings, improved production, and reduced down-time!



"The boss actually congratulated me when I showed him the savings Torit preventive maintenance gives us!"

Torit Dust Collectors stop dust build-up before it costs you money. They're available in both high efficiency cyclone and cabinet type units. Why not check into them today—write:

TORIT manufacturing company

Walnut & Exchange Streets, St. Paul 2, Minn. Dept. 420.

Field Report . . .

General Electric, Erie, Penna, they'll power diesel-electrics being built for the South African Railway as part of South African Railway Administration's $47.5 million modernization program.

New Plant in NC

Ingraham Co, a Bristol, Conn, manufacturer of clocks, watches, and industrial timing devices is leasing a 100,000 sq-ft plant in Laurinburg to serve as a branch assembly unit. Operations are expected to begin in the spring with initial work force of 500.

Navy Adds to Grumman Contract

Grumman Aircraft Engineering Corp has a $22 million follow-on order to turn out additional anti-submarine airplanes, the S2F-3. This follows an $11.6 million production order for the new plane awarded Grumman last May.

US Chemical Milling Corp Enters the Coffee Break

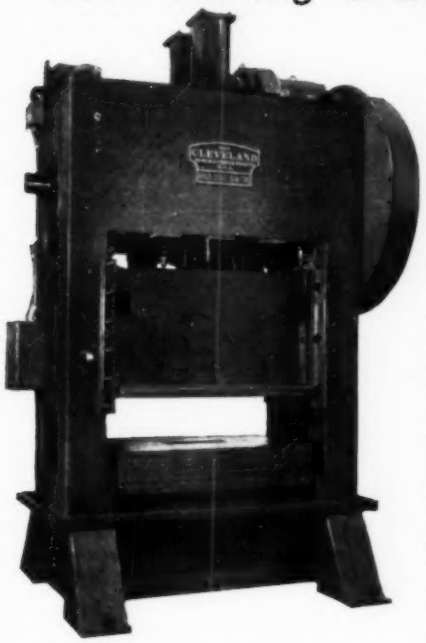
The Manhattan Beach, Calif, company has a $2 million contract for production of several thousand fully automatic, fresh-brew coffee and hot chocolate vending machines that'll be marketed nationally by Automatic Foods Corp, Chicago. USCMC will manufacture all the basic components and assemble the final product but will subcontract a considerable portion of the business to suppliers of special pumps, heating elements, coin changers, and similar equipment. Tooling for the fabrica-

"Yes sir, Shorty, I was sure glad you were around when I got that idea."

For Greater Economy In Metalworking

CLEVELAND

Cost-Cutting PRESSES

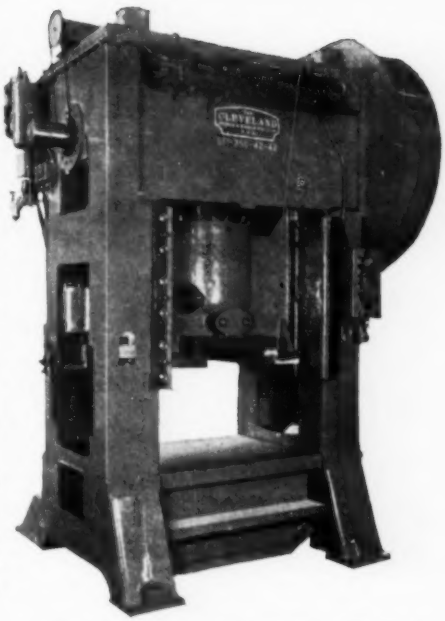


Cleveland high-speed Double Eccentric Press, 200-ton capacity, operates at 50 to 150 strokes per minute for high-speed punching, shearing, perforating, bending and forming.

Are production breakdowns, slow outmoded presses and mounting maintenance costs destroying your profits? A check of your press performance records may show you're already paying for new presses . . . *without their benefits.*

For lower operating costs, quicker starting, increased production, investigate the new minimum-maintenance Cleveland Presses. Our engineers are ready to help you plan a program of replacing old inefficient presses with modern cost-cutting Cleveland Presses of the exact type, size and capacity to meet your need.

You get better stampings for less with a Cleveland Press.



Cleveland's cost-cutting Single Eccentric Press, 350-ton capacity, operates at 60 strokes per minute, has air-counterbalanced slide and auxiliary air brake on flywheel.

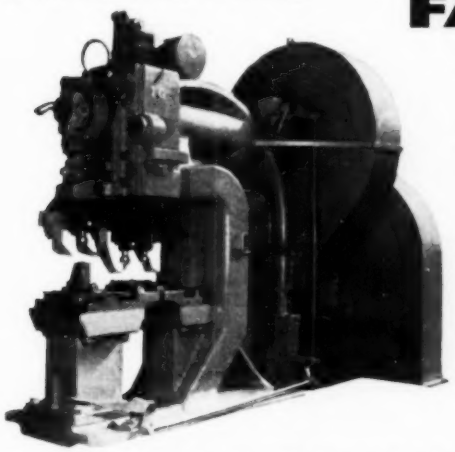
FABRICATING TOOLS

For Plate and Structural Steel

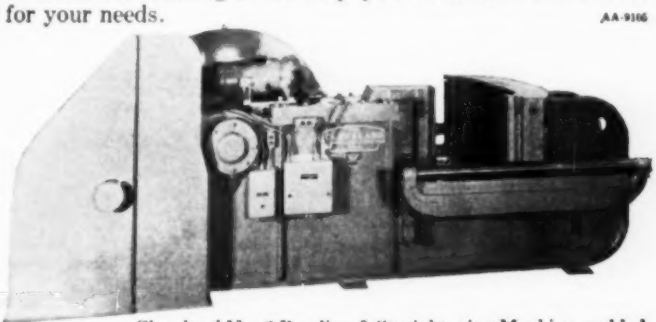
Ruggedly built for profitable production and simplicity of operation, Cleveland Fabricating Tools are designed for trouble-free operation and years of service—a fact proven by leading shipyards, bridge builders, railroads, structural shops and boiler makers since 1880.

For punching, coping, notching, shearing, bending and planing I-beams, steel plate, bars, angles and other structural shapes, you can do it better, more economically with Cleveland Fabricating Tools. Write for Catalog #9 to help you determine the correct tool for your needs.

AA-9166



Cleveland I G Beam Punching Machine equipped with 3 gaged punching attachments, one high and two low die holders, 24" throat, completely enclosed gears and flywheel, punching capacity: standard 6" to 24" I-beams in flange and web. Other capacities and sizes available.



Cleveland No. 2 Bending & Straightening Machine, welded steel frame, completely enclosed gears and flywheel, arranged for direct-drive motor and equipped with power adjustment to plunger through separate motor. Capacity: bend or straighten 24" I-beams vertically or horizontally.

THE CLEVELAND PUNCH & SHEAR WORKS CO.
Established 1880

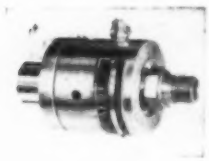
Power Presses
Fabricating Tools
Punching Tools & Dies

E. 40th and St. Clair Avenue, Cleveland 14, Ohio

CIRCLE 280 READER SERVICE CARD

Gun Drilling Lets You DRILL PRECISION HOLES *Faster! Cheaper!*

Sealol coolant supply accessories help you get maximum results from any gun drilling operation.



TYPE EL FLUID TRANSFER

Cycling pressures to 1,000 psi and speeds to 10,000 rpm.

Attaches to outboard end of hollow-spindle equipment to transfer coolant to the rotating gun drill.

TYPE DH DRILL ADAPTER

Pressures to 1,000 psi and speeds to 10,000 rpm.

Adapts solid spindle equipment to accept rotating gun drills. The coolant transfer is integral with the adapter spindle.

HI-PRESSURE COOLANT SUPPLY UNIT

For all types of precision gun drilling. Pumps, cools, filters coolants at pressures to 1,000 psi—to 40 gpm (higher capacities available).

SEND COUPON TODAY!

SEALOL

SEALOL CORP.
202 Post Road, Providence 5, R. I.

Please send free bulletins covering Sealol gun drilling accessories.

NAME

TITLE

COMPANY

ADDRESS

Field Report . . .

tion and assembly lines has been completed, and manufacturing of the machines is running at the rate of 150 a month. Full production in excess of 300 machines is scheduled this month.

Holley Carburetor Co . . .

. . . Detroit, is exercising an option to purchase property and plant facilities of the Paris Manufacturing Co at Paris, Tenn. Plant, built for Holley in 1949 by Paris Industries Inc through stock sales to local citizens, has grown from initial employment of 60 to the present 705 with annual payroll of over $2 million.

American-Standard Forms Industrial Div

New Industrial Division has been created by consolidation of the American-Blower, Kewanee Boiler, and Ross Heat Exchanger Divisions of the company which has eight other operating divisions throughout the country. New division will continue to manufacture and market the same products made by the three separate units. These include air handling and conditioning equipment, commercial and industrial boilers, fluid drives, heat exchangers and surface condensers.

Scottish Firm Licensed To Make Aeroquip Products

License agreement completed between King Aircraft Corp, Glasgow, Scotland, and Aeroquip Corp, Jackson, Mich, authorizes King to

"Then when I asked him for a cut in pay he sent me over here!"

Fast Delivery

Quality

SIMONDS INDUSTRIAL CUT GEARS

★ **FINISHED GEARS**
★ **CUSTOM GEAR CUTTING**
★ **HEAT-TREATED, CASE OR FLAME-HARDENED**

You are sure of quality and prompt service when you place your industrial cut gear requirements with SIMONDS GEAR. We produce the full range of sizes in the types and materials you need from your blanks or ours. Let us quote on your next gear requirements.

* * *

Stock carrying distributors of Ramsey Silent Chain Drives and Couplings; and industrial V-belts.

SPUR GEARS
BEVEL GEARS
MITRE GEARS
WORMS • WORM GEARS
RACKS • PINIONS

Cast or forged steel, gray iron, bronze, Meehanite, rawhide or bakelite

SIMONDS GEARS

THE SIMONDS GEAR & MFG. CO.
LIBERTY at 25TH PITTSBURGH 22, PA.

CIRCLE 281 READER SERVICE CARD

CIRCLE 282 READER SERVICE CARD

Bridgeport Ultra Fine Grain Brass puts more allure in a lure ...and more profit in your product!

Clear, polished or painted, "Dardevle" fishing lures, made by Lou J. Eppinger Mfg. Co., Detroit, Mich., are world famous for their deadly, sure-fire allure.

There's more than one reason for this magic appeal. But to designers and production men, the most important is the Bridgeport Ultra Fine Grain Brass from which the lures are made. This ductile, easily formed brass provides superior surface properties which help cut finishing costs to the bone.

In Eppinger's case, for instance, some of the lures are clear polished and lacquered. Others are hand-painted. Ordinarily, these two different operations would call for two different types of metal. But, by using Bridgeport Ultra Fine Grain Brass, the same material can be used for either finish, an important purchasing saving.

If you're fishing for ideas on how to reduce your strip metal finishing costs, cast a line in Bridgeport's direction. Call your nearby Bridgeport Sales Office . . . or write direct for a copy of our Ultra Fine Grain Brass booklet, GRAIN SIZE, THE FOURTH DIMENSION. Dept. 0000.

BRIDGEPORT BRASS COMPANY

Bridgeport 2, Connecticut • Sales Offices in Principal Cities

Specialists in Metals from **A***luminum to* **Z***irconium*

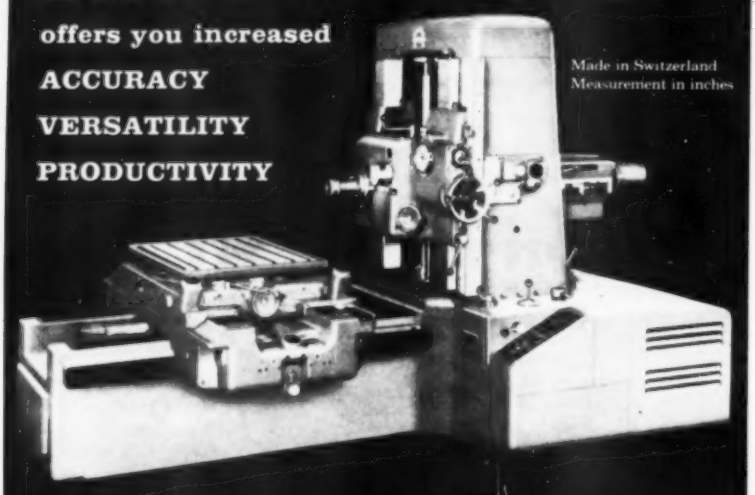
Now

AUTOMATIC POSITIONING

with the

DIXI 75 horizontal optical jig borer

offers you increased
ACCURACY
VERSATILITY
PRODUCTIVITY



Made in Switzerland
Measurement in inches

- Automatic positioning can be changed instantly to manual operation
- Projected optical setting — direct reading to .00005" for linear motions and 1 sec. of arc for built-in rotary table. Linear optics provided with adjustable zero reference
- Simplified controls functionally arranged for greater operating speed and efficiency
- 3" diameter boring spindle
- Increased capacity: table size 39⅜" x 32"; 29½" cross travel; 23⅝" longitudinal travel; 25⅝" vertical travel
- Hydraulic feeds and infinitely variable spindle speeds
- Rear support optional

See the DIXI 75 in operation at the
WESTERN METAL CONGRESS AND EXPOSITION
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Los Angeles, Calif.
March 16th-20th

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M. B. I. EXPORT & IMPORT LTD.
A DIVISION OF MACHINERY BUILDERS, INC.
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"Over 25 years' experience in designing and building machinery."

Field Report . . .

manufacture and sell in Great Britain the products of Aeroquip's General Logistics and Marman Divisions. GL equipment includes load control and cargo tie-down devices for general aircraft, industrial, and freight transportation uses. Major products of Marman are V-band and channel band couplings, clamps, bands, straps, joints, and ducting components for aircraft and industrial applications. King is a leading British producer of aircraft accessories.

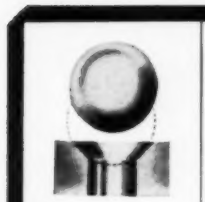
North Carolina Setting Up New Research Institute

Research Triangle Institute will be established in the center of the small triangle formed by the University of North Carolina in Chapel Hill, Duke University in Durham, and North Carolina State College in Raleigh. More than $1,250,000 has been contributed to the project so far by business and industry in the state. Funds will be used to erect the first of several buildings in a 4000-acre Research Triangle Park in the center of the area. Institute will carry out contract research for industry, business, and government; control will be vested in a non-profit foundation.

First president is George R Herbert, former executive director of Stanford Research Institute in California and, until last December, treasurer of American and Foreign Power Co.

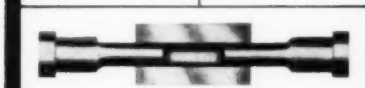
(continued on page 172)

"Vimpson! Stop horsing around with that sheave!"



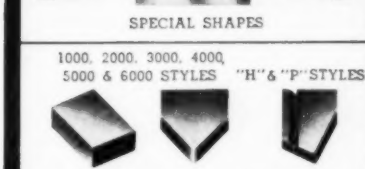
BALLS & SEATS FOR CHECK VALVES

COMPRESSOR SLEEVES & RINGS



SPECIAL SHAPES

1000, 2000, 3000, 4000, 5000 & 6000 STYLES "H" & "P" STYLES



"RT" STYLE

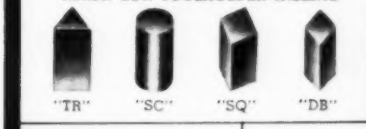
"RTT" STYLE

"STB" STRIPS

ROD STOCK

KLAMP-LOK TOOLHOLDER INSERTS

"TR" "SC" "SQ" "DB"



THROW-AWAY INSERTS FOR KLAMP-LOK HOLDERS

"MB" BLANK

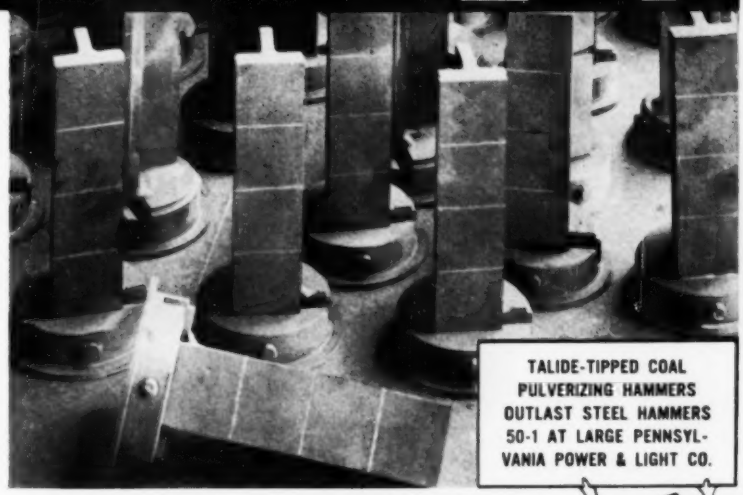
TWIST DRILL BLANK

HELICAL BLANK

GUN DRILL BLANKS

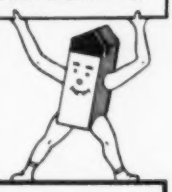
"TD" BLANK

Outlasts Steel 50 to 1!



TALIDE-TIPPED COAL PULVERIZING HAMMERS OUTLAST STEEL HAMMERS 50-1 AT LARGE PENNSYLVANIA POWER & LIGHT CO.

• TALIDE METAL, a tungsten carbide of superior quality, is harder, stronger, and more resistant to abrasion than any other metal. Properly applied, it gives superior service on applications where wear, heat, strain and shock are destructive to other metals.



- **ABRASION RESISTANCE**—Up to 100 times that of steel.
- **COMPRESSIVE STRENGTH**—Higher than all melted, cast or forged metals and alloys.
- **RESISTANCE TO DEFORMATION**—2 to 3 times greater than steel.
- **HEAT RESISTANCE**—Resists oxidation and thermal shock up to 1500°F.
- **THERMAL EXPANSION**—Less than half the rate of steel, "creep" is negligible.
- **FRICTIONAL RESISTANCE**—Lower than steel, non-galling, "slippery" properties higher.

• TALIDE METAL is saving industry millions of dollars annually by wear-proofing vital parts on machine tools, presses, pumps, compressors and other types of processing equipment used in the steel, oil, chemical, plastic, auto, rubber, textile, glass, mining and metalworking industry. The physical properties of the most commonly used grades are listed below. Other grades are available for specialized applications.

PHYSICAL PROPERTIES OF TALIDE METAL (P. S. I.)

Application	Operation	Talide Grade	Rockwell "A" Hardness	Specific Gravity (Density)	Transverse Rupture Strength	Compressive Strength	Co-Efficient of Thermal Expansion	Modulus of Elasticity (Deflection)
WEAR SURFACE	No Shock	C-91	91.8	14.90	235,000	710,000	3.00x10-6	91,000,000
	Light Shock	C-99	91.0	14.75	265,000	670,000	3.65x10-6	84,000,000
	Medium Shock	C-88	89.5	14.55	295,000	635,000	4.00x10-6	80,000,000
IMPACT	Light	C-85	88.4	14.25	315,000	600,000	3.75x10-6	77,000,000
	Medium	C-80	87.0	13.85	335,000	550,000	4.50x10-6	74,000,000
	Heavy	C-75	85.0	13.15	355,000	500,000	5.00x10-6	70,000,000

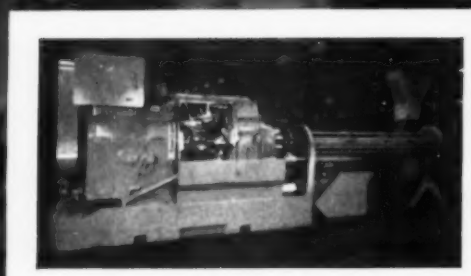
Note: Hardness values may vary plus or minus .2 to .3 on individual lots.

Metal Carbides Corporation Youngstown 12, Ohio

Send for Catalog 56-G

METAL CARBIDES CORPORATION MC TALIDE® YOUNGSTOWN 12, OHIO

HOT PRESSED AND SINTERED CARBIDES • VACUUM METALS
HEAVY METAL • ALUMINUM OXIDE • HI-TEMP. ALLOYS
OVER 25 YEARS' EXPERIENCE IN TUNGSTEN CARBIDE METALLURGY



Acme-Gridley, 1¼" RB 8 producing 690 nozzle bodies per hour

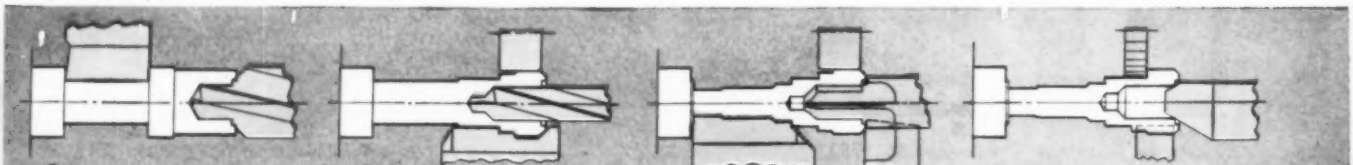
Close-up of tooling zone showing 5th, 6th and 7th positions.

ACME-GRIDLEY ELIMINATES SECONDARY OPERATIONS...

for Eagle Manufacturing Company

- Direct Cost Reduced 48%*
- Production Time Reduced 64%

* Details on request


8. Feed out—rough form rear diameter—counterbore and drill large hole part way
1. Form two front diameters and chamfer head—drill large hole remainder—support
2. Form two rear diameters—ream large hole—face end—support
3. Stop spindle rotation—mill flat—support

As a part of a continuing contribution to all phases of cost reduction, National Acme engineers initiated the development work necessary to effect important savings for this 65 year old Wellsburg, W. Virginia company.

The aluminum nozzle body of their hydraulic pump oilers formerly had been produced on a six spindle automatic and two other machines performing secondary operations. Visionary machine tool engineering made possible the application of spindle stopping and positioning on an eight-spindle Acme-Gridley to complete the entire piece *in the primary set-up . . . and increase net production.*

Advanced design and development such as this, together with wide open tooling zones, independently operated tool slides and the extreme accuracy and flexibility of direct camming . . . makes possible the solution of "unusual" jobs an "every day" occurrence at National Acme.

Write or ask one of our representatives for the complete story on the industry's most modern approach to *your* cost reduction problem.

NATIONAL ACME'S

"ZONE OF RESPONSIBILITY"
INCLUDES ALL PHASES OF COST REDUCTION

Check YOURS...Then Check National Acme

Direct Costs: these include direct dollar savings as realized by the Eagle Manufacturing Company . . . an "every day" job for Acme-Gridleys.

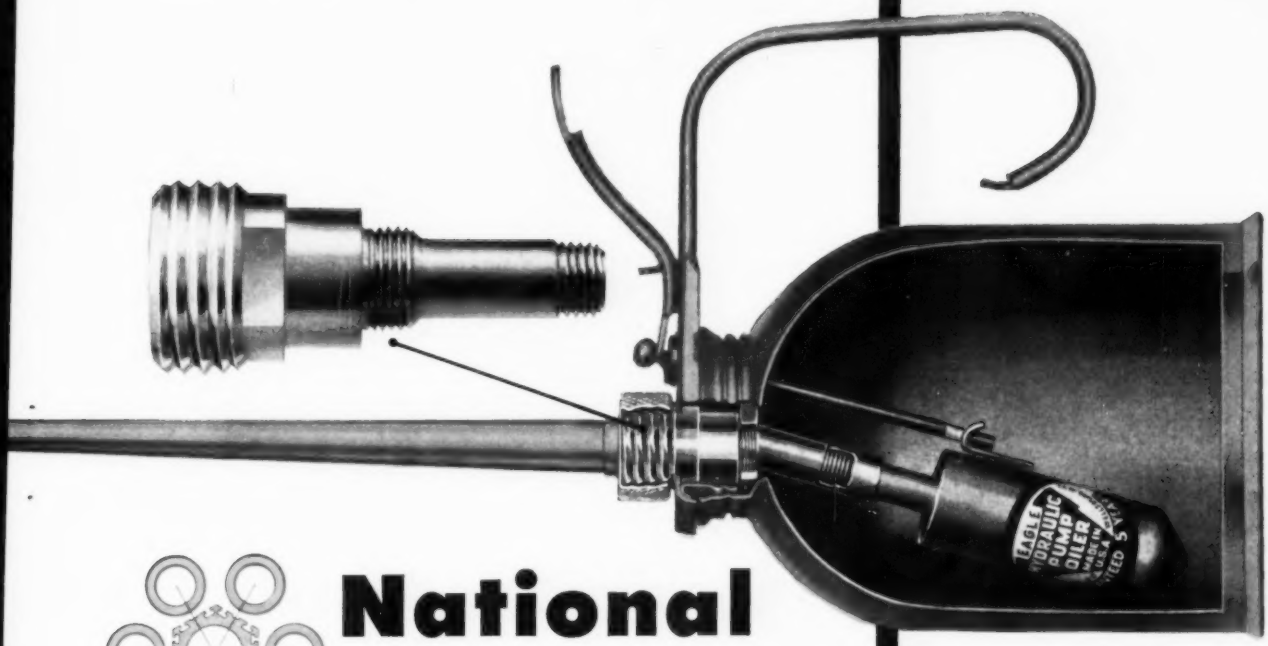
Indirect Costs: effecting important savings in maintenance, downtime, scrap reduction, tool costs, etc.

Product Redesign: teaming with your design group to take full advantage of Acme-Gridleys' cost reducing capabilities.

Direct Material Costs: our engineers provide important savings in this area by constantly matching machines and tools to modern metallurgical problems.

Make-or-Buy Reviews: in many cases our Contract Division can assume your production headaches and relieve you of immediate capital investment.

Spot Modernization: pioneering in modern tooling methods, and the flexibility of Acme-Gridleys can provide many "on-the-spot" savings.



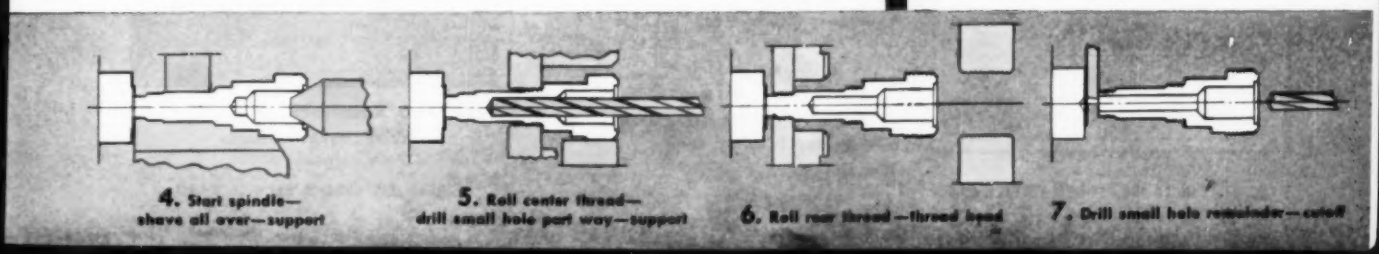
National Acme

The National Acme Company
171 E. 131st Street
Cleveland 8, Ohio

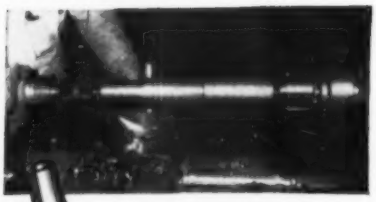
Sales Offices: Newark 2, N.J.; Chicago 6, Ill.; Detroit 27, Mich.

Pioneer in Circumferential Automation

15 Operations in 5.5 Seconds


4. Start spindle—shave all over—support
5. Roll center thread—drill small hole part way—support
6. Roll rear thread—thread head
7. Drill small hole remainder—cutoff

New "Driving Center" Introduces Faster Machining Techniques on work Held Between Centers



Eliminates Chucks and Clamps... Permits Full End-to-End Machining... "Loads" or "Unloads" without Stopping

A new development to increase both output and accuracy, the Ideal Driving Center grips the end face of the work and so eliminates entirely the need for chucks, dogs or other bulky clamping devices.

New machining techniques and remarkable cost savings are thus made possible. Chucking time is completely eliminated and work may be machined from end to end without removal or change. Usually the machine can be loaded and unloaded without stopping, which substantially reduces wear on motors, belts, gears and clutches.

Quality of work is generally improved, because rigid direct-drive action reduces backlash and eliminates slippage. Precision indexing on gear hobbers and mills is simplified.

Preliminary machining is unnecessary; self-compensating pins grip and hold non-uniform work-ends — even odd-shaped pieces that cannot be held by other means.

Lathe or other machine operators do not have to learn difficult new methods. The Driving Centers are available in catalog models providing 63 combinations to fit maximum work diameters from ⅞" to 6⅜", in Morse tapers 2 to 6. Larger sizes may be had as "specials".

Complete details of operating principle and selection chart will be sent without obligation. Mail coupon below to

IDEAL INDUSTRIES, Inc.

IDEAL

IDEAL INDUSTRIES, Inc.
1057B Park Ave., Sycamore, Ill.

Please send me complete engineering data and selection chart for IDEAL Driving Centers.

Name_____

Company_____

Address_____

City_____ Zone____ State_____

Field Report . . .

Marquardt Aircraft Subcontracting Air Force Contract

Marquardt, Van Nuys, Calif, has an AF contract for air induction control subsystems for the Valkyrie aircraft. Amount of the contract was not disclosed, but company reports that a large percentage will be subcontracted to small firms.

Waste King Acquiring Cribben & Sexton Co

Waste King Corp of Los Angeles plans to take over operating control of the Chicago company through purchase of majority of its common stock, anticipates sales of $35 million in the coming fiscal year for its own and C&S's product lines, will operate C&S as an autonomous company. Both companies make household and industrial appliances; Waste King's Technical Products Div, in addition, provides diversified manufacturing operations for missile and aircraft industry.

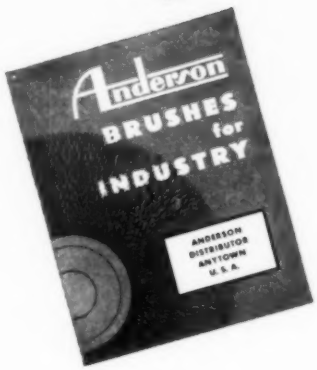
Calif Firm Sublets Fla Operation

A federal judge in Miami has decided that Airtek Dynamics, Inc, of California will be given an opportunity to operate the aluminum manufacturing properties of the bankrupt Ludman Corp, Miami. Airtek will pay rent on the main plant and a share of the taxes, plus $2500 a month to the trustee for administrative expenses, in addition to buying $30,000 worth of the plant's machinery and inventory annually.

"Bring some of your cutting oil home tonight, dear—baby is cutting teeth—"

THE TOOL

THE TECHNIQUE



For lowest cost per unit processed they're both

Anderson

Write for complete catalog of wire brushes, with detailed selection and operation data.

Anderson

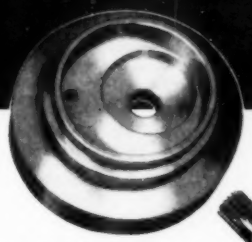
ANDERSON CORPORATION

1056 Southbridge Street Worcester, Mass.

DAYSTROM
Electric Corp.

– puts it on a RIVETT!

Battery of Rivett 1020S Lathes in the Research and Development Division of Daystrom Electric Corporation, Poughkeepsie, N. Y.



Brass piece with off-center counterbore and through-hole completely machined on a 1020S Rivett.

Machined on a 1020S from 4140 steel *after tempering* at a Rockwell hardness of C 20-25.

Productivity!

Daystrom machines model parts with an eye to normal manufacturing methods. For this reason Daystrom highlights an important Rivett feature — productivity — in its statement:

"We have found that the Rivett 1020S Lathe is one of the most useful and all around productive machines in our model shop, and is so constructed that it is easy for an average operator to obtain the dimensions and finish necessary in our work."

"Model work requires holding concentricity to .001" T. I. R. between several diameters; turning is often held to several tenths. And, a finish of 32 micro inches and better is quite easily obtained!"

RIVETT LATHE & GRINDER, INC.
Dept. AM-2 Brighton 35, Boston, Mass.

Inquire about the 1020 Toolroom Precision Lathe now. Write for 16-page catalog and the name of your nearest dealer.

RIVETT
"Steelway" Lathes

CIRCLE 290 READER SERVICE CARD

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DIXIE CUP

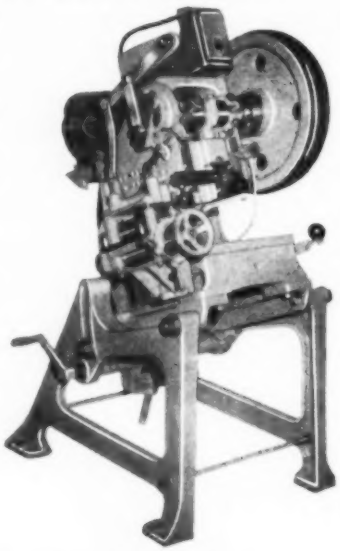
Division of AMERICAN CAN COMPANY

REQUIRE A BATTERY OF SPECIALLY DESIGNED PRESSES FOR THEIR OPERATION.

PERKINS PRESSES

were specially engineered to meet their specific requirements. Presses for Dixie Cup were constructed with additional die space and special feed rolls. As with all Perkins Presses, speed, accuracy, safety and long life are an integral part of every machine.

There is a Perkins Press to meet every requirement for forming, bending, notching and punching. If our standard models won't meet your special requirements, our engineers will *build a press that will.*



Write Dept. AM-6 for complete technical information.

Be on the SAFE side. Consult PERKINS first.

PERKINS MACHINE COMPANY
WARREN, MASS., U.S.A.

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

MACHINES AND ATTACHMENTS

1 MILLING MACHINES — *Farrel-Birmingham Co, Consolidated Machine Tool Division, 565 Blossom Rd, Rochester 10, N.Y.* 32-page bulletin 675-A contains illustrated description of complete Newton line of special production-line units. Types included are straight-line, vertical openside, sliding head, shuttle type, rise and fall, rotary index, traverse, planer, and traveling column. Other Newton machine tools pictured and discussed.

2 POWER PRESSES — *Sales Service Mfg Co, 2365 University Ave, St Paul 14, Minn.* Illustrated bulletin 1158 gives details on 2 and 5-ton Press-Rite units in the Juniorline series that includes bench and floor styles in standard, deep throat, and air friction clutch models.

3 TURRET DRILLING, TAPPING, AND BORING MACHINES—*Burg Tool Manufacturing Co, 15001 S Figueroa St, Gardena, Calif.* 4-page bulletin gives data on line of standard Burgmaster machines including hand-operated turret drills, radial type, automatic hydraulic, numerically tape controlled, special type turret drills, and line of Tool Flex floating toolholders. All machines have power indexing to the turret and preselective spindle speeds. Capacities in steel range from ¼ in. for the bench Model 0 to 1½ in. on the 3 BH Model.

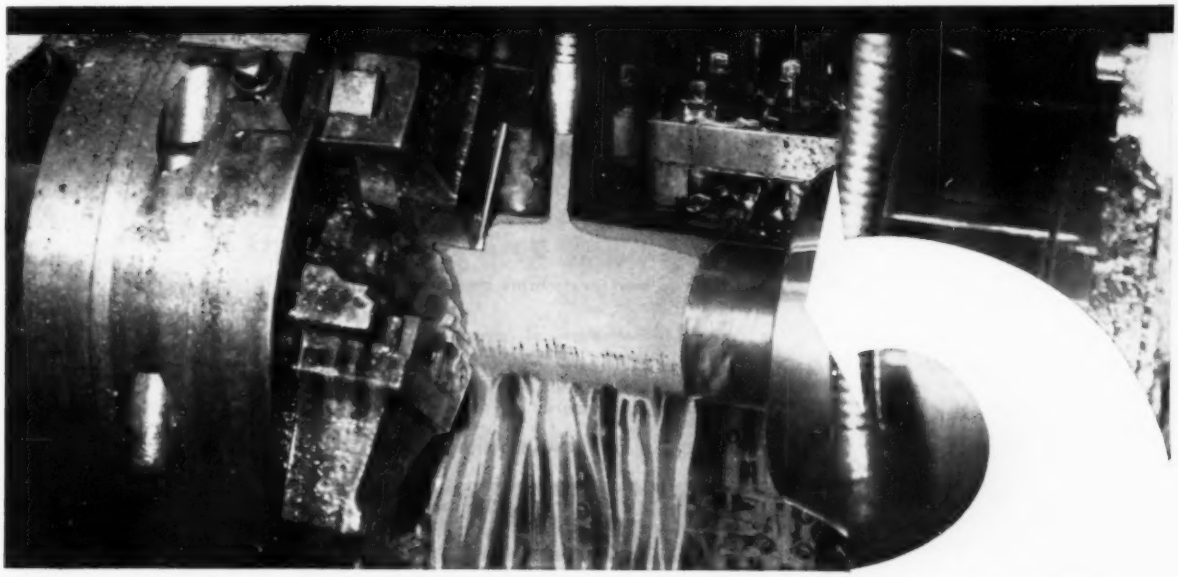
TOOLS AND ACCESSORIES

4 CUTTING TOOLS—*Wendt-Sonis Co, 10th & Collier Sts, Hannibal, Mo.* 72-page catalog 59 pictures and gives specifications for extensive line of carbide cutting tools, blanks, and inserts. Covers reamers, drills, end mills, milling cutters, counterbores, single point tool blanks and inserts, plus illustrated section that includes grinding and operating suggestions, selection table for determining correct carbide grades and machining speeds and carbide manufacturers grade recommendations. Catalog 59-A illustrates complete line of mechanical toolholders, both negative and postive styles, with inserts, chipbreakers, and replacement parts.

5 SUBLAND DRILLS—*Mohawk Tools, Inc, Montpelier, Ohio.* 12-page catalog presents illustrated discussion of advantages of drilling-chamfering with Mohawk standard units. Lists all standard subland drill sizes and types, plus a simplified method of determining specific tool requirements.

"Wait a minute. We may have an opening after all!"

a "NEW LEAF" in coolants... New 100% Chemi-Cool HOCUT cools... lubricates... prevents rust... stays mint-fresh for life!



No other cutting fluid does so much, so well, for so long ... as NEW HOCUT 237

Permanently odor-free—Needs no "additive" to stay clear and fresh-smelling for life. Cannot turn rancid or harm hands. Keeps your shop clean and your operators happy.

Cools work and tools quickly—Faster cooling speeds machining time—prevents welding and chip build-up, and increases tool life.

A lubricant that works—The secret is in new synthetic high-molecular-weight lubricity additive—which, in plain language, means the needed lubrication advantages of a "soluble oil"—with none of the disadvantages.

Protects tools and work from rust—Work coming off the machine is coated with a two-stage rust preventive. Tools, ways, slides and bearings get permanent protection.

Best for economy—Initial cost is only a few pennies per gallon, in the machine. Expense of clogged filters is practically eliminated and filtration speeded up. HOCUT can be used and re-used for months and disposal is never a problem.

For positive proof of new HOCUT's unique properties and economy—in your own plant—call your Houghton Man today. Or write: E. F. Houghton & Co., 303 W. Lehigh Avenue, Philadelphia 33, Pa.

HOCUT 237 ... *a product of*

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Ready to give you on-the-job service

CUT THOSE *EXTRA* COSTS THE **New Method WAY!**

NM Model 500-C Automatic Roll Marker

DO YOU USE

SEPARATE SETUPS FOR STANDARD AUTOMATIC OD MARKING?

Other New Method Automatic Marker Models

NM Model 700—the cut-off marker for custom OD marking.

NM Model 900—Super automatic roll marker for most types of radial end-face marking.

NM Model 600-E—for end-face marking.

★ There's a New Method automatic marker for most marking and identifying requirements, each designed for a specific need.

★ New Method also manufactures a complete line of manually operated marking devices.

Advantages of Model 500-C

- ***Eliminates*** **need for separate setups**
- ***Provides*** **easy die change**
- ***Automatic*** **reset**
- ***Adjustable*** **stop for accurate starting position**
- ***Assures uniform depth*** **of impressions on parts**
- ***Drag or scoring*** **of part prevented by starting pad guards**

★ ***Write TODAY for*** **500-C brochure**

NM SINCE 1931

NEW METHOD STEEL STAMPS, INC.

147 JOS. CAMPAU • DETROIT 7, MICHIGAN

CIRCLE 293 READER SERVICE CARD

PRECISION DRILL GRINDING:

Black Diamond* does it better, faster, easier

1 INSERT

2 PUSH

3 TWIST

4 GRIND

Black Diamond Grinders are saving drills . . . saving labor costs . . . saving production time in actually thousands of shops. Reason #1: no drill grinder made does the job so fast and so easily . . . and there's absolutely no skill required! Anybody — yes anybody — can restore like-new sharpness to dull drills with absolute accuracy in just ten seconds!

If your drills, your time and your money are worth saving, you ought to get the facts. They're yours for the asking. **Write exclusive distributor:**

EDWARD **BLAKE** COMPANY, INC.

Dept.4, 440 Cherry St., West Newton 65, Mass.

***Black Diamond Saw & Machine Works, Inc.**

Natick, Mass.—Manufacturers of Black Diamond and Worcester Drill Grinders.

Black Diamond Drill Grinders: For #70 drills up to ¾"

Worcester Drill Grinders: For ⅛" drills up to 2½"

Free Literature

To order any of these bulletins, circle corresponding number inside back cover.

6 HSS CUTTING TOOLS — *Quality Tool Works, 760 S Market St, Waukegan, Ill.* 11-page catalog 58 pictures and gives details on complete line of standard and specials for toolroom and production use including several styles of Woodruff keyseat cutters, milling cutters, and slitting saws. Quick Change as well as standard holders for straight and taper shank Woodruff cutters are available.

7 PORTABLE HAND TOOL—*Chicago Wheel & Manufacturing Co, 1101 W Monroe St, Chicago, Ill.* 12-page catalog 6065 illustrates and describes the Hi-Torque Handee and Hi-Power grinders and accessories. Covers variety of uses, operation instructions, and suggested applications. Pictures mounted wheels, saws, brushes, cutters, drum sanders and bands available for use with the tool.

8 AUTOMATIC DEW POINT RECORDERS AND CONTROLLERS—*Surface Combustion Corp, 2375 Dorr St, Toledo 1, Ohio.* 6-page bulletin SC-181 describes Autocarb systems for control of carbon potential and their applications. New standardized line of control instruments illustrated; chart for selecting proper system included.

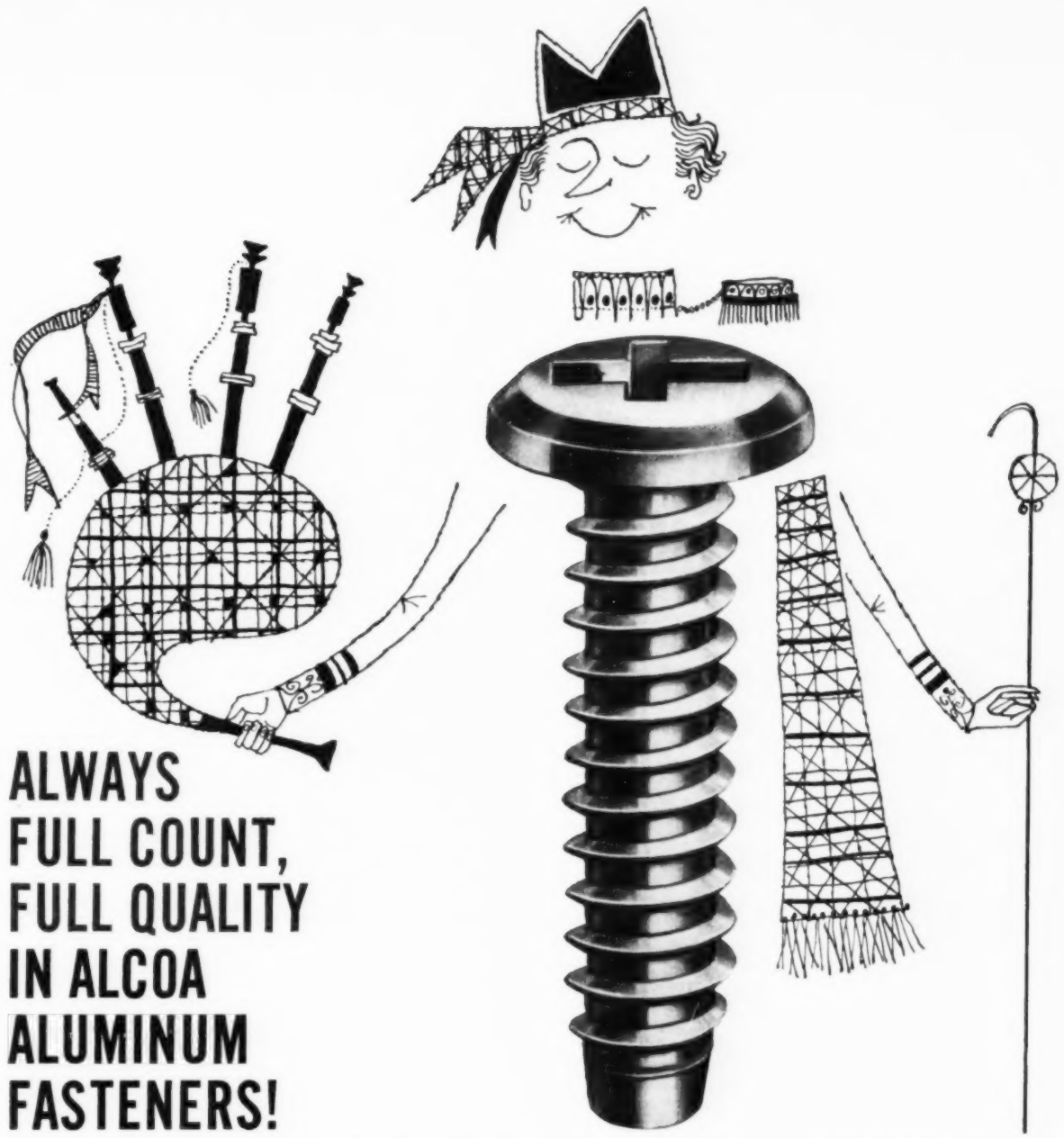
9 GEAR CHECKER—*Michigan Tool Co, 7171 E McNichols Rd, Detroit 12, Mich.* 4-page bulletin 1218-A contains illustrated description of Model 1218-A, a checking instrument with an integrated optical system for easy and accurate checking of gear leads. Eliminates gage blocks, multiple settings, micrometers, verniers, and gear trains from the setup procedure. Details design, construction, and operation; describes advantages and discusses capacities and specifications.

10 CARBIDE DRILLS FOR HARDENED STEEL—*M A Ford Mfg Co, 1545 Rockingham Rd, Davenport, Iowa.* Bulletin 806 contains information on Hi-Roc solid carbide drills. Includes specifications, operational instructions.

11 DYNAMASTER ELECTRONIC INSTRUMENTS—*Bristol Co, Waterbury 20, Conn.* 64-page bulletin P1245-A contains complete specifications of potentiometer and bridge instruments in indicating, recording, and controlling models. Includes information on new rack mount-

(continued on page 179)

"I don't think the plant will last out the week."



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YOU'LL FIND 144 or more *perfect* fasteners in *every* gross box when you order from your local Alcoa Distributor. On bulk items, too, you'll receive the number of pieces ordered. And there'll be no rejects, no misfits, no "seconds" . . . whether you buy a hatful or a carload!

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GOOD NEWS FOR COST MINDED TOOL ENGINEERS

STANDARDIZED UNIVERSAL INDEX PLUNGERS COST 75% LESS THAN SPECIALLY-MADE TOOL ROOM PLUNGERS

In jig or fixture manufacture, it's both expensive and time-consuming to design and machine special index plungers for multi-station tools. To save time and money use Universal Straight or Taper Plungers. They are made in standard sizes . . . come complete, ready for installation . . . at approximately ¼ the cost of specially made tool room plungers. Universal Index Plungers can be assembled from either top or bottom and can be removed in either direction. Because the Universal plunger body and bushing have the same standard diameter . . . all holes can be bored with the same tool, simplifying drilling of jig or fixture in fabrication.

Universal Index Plungers can be actuated by either hand lever or air cylinders for automatic indexing tools. The locating bushing, plunger and plunger bushing are hardened and ground . . . precision built for extreme accuracy and long wear. Write for catalog detailing plungers plus other Universal production tools.

OTHER PRECISION-BUILT COST-SAVING UNIVERSAL PRODUCTION TOOLS

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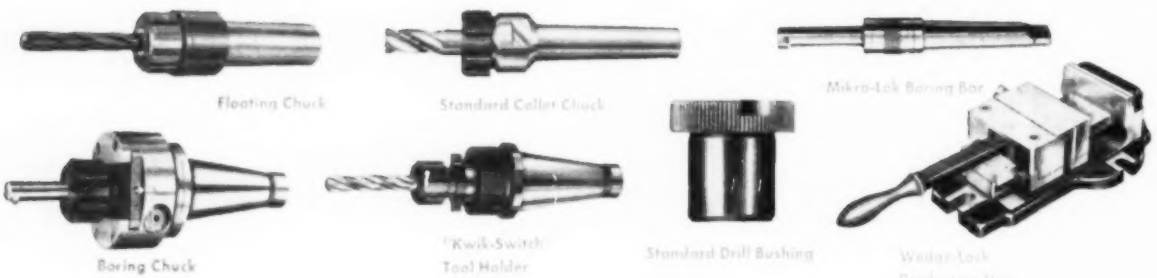

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ing instruments, high-speed and multipoint instruments, and miniature instruments, in addition to descriptions of round-chart and strip-chart models.

12 INTERFEROMETERS AND DILATOMETERS — *Gaertner Scientific Corp, 1201 Wrightwood Ave, Chicago 14, Ill.* 8-page brochure 140-58 describes line of dilatation interferometers and quartz tube dilatometers. Outlines the theory of dilatation measurements and discusses use of three instruments for determining thermal expansion.

HEAT TREATING AND WELDING

13 FURNACE AND ATMOSPHERE GENERATOR SELECTION CHART —*C I Hayes, Inc, 810 Wellington Ave, Cranston 10, RI.* 11 x 17-in. chart simplifies relation of application requirements directly to furnace and atmosphere equipment. Lists all major heat treating categories—annealing, brazing, carbonitriding, carburizing, enameling, hardening, normalizing, etc, and is directly cross-referenced to the furnace or atmosphere generator recommended for the specific process listed under these major categories. Details over 100 different materials and operations.

14 HIGH-TENSILE ELECTRODES — *Lincoln Electric Co, Cleveland 17, Ohio.* Technical data sheet 7205.1 presents data on Jetweld LH-90 and Jetweld LH-110 for welding HY-80, T-1, and other 90,000 and 110,000 psi tensile strength steels. Operating characteristics, physical properties, markings and current ranges tabulated; procedure discussed.

15 GAS REGULATORS—*Air Reduction Sales Co, Div of Air Reduction Co, 150 E 42nd St, New York 17, NY.* 36-page catalog 806 (form ADC 705F) covers complete line of cylinder, manifold, and station pressure regulators. Illustrated booklet contains flow and pressure specifications as well as inlet and outlet connection dimensions for each. Adapters, station valves, flowmeters, hose connections, and pressure gages also described.

16 WELDING WIRE COMPARISON CHART—*Page Steel and Wire Division, American Chain & Cable Co, Monessen, Penna.* 4-page folder, bulletin DH-1218-0, details physical properties, as welded; gives analyses, tensile strength, elongation, and average Rockwell hardness numbers. Lists typical uses of gas welding rods, bare electrodes, automatic

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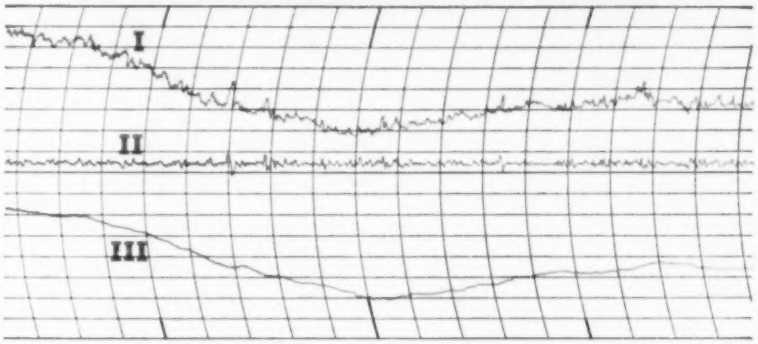

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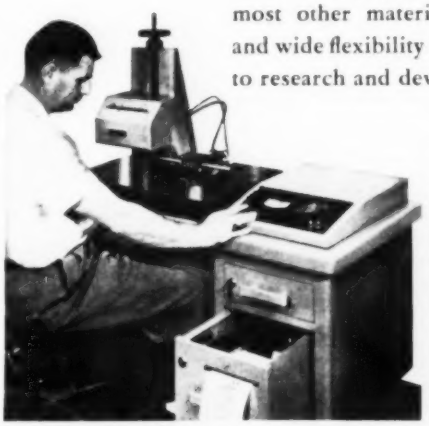

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welding wire, and metal spray wire. Comparisons between Page products and competitive makes are presented.

17 SILVER BRAZING PASTE ALLOYS—*Fusion Engineering, 17921 Roseland Ave, Cleveland 12, Ohio.* Engineering data sheet 88-1 describes three types of silver brazing pastes, S-4, ST, and S-5, that cover virtually all applications in the silver brazing field. Each basic type is available with any standard or special silver braze alloys. Includes technical data on uses.

PLANT SERVICE EQUIPMENT

18 ROLLER-GRAVITY CONVEYORS —*Lamson Corp, Syracuse 1, NY.* 50-page handbook contains illustrated applications of wide variety of conveyors and conveyor systems. Covers design and engineering features and data, specifications, dimensions, and accessories. Wheel gravity and portable conveyors discussed. Charts and graphs aid in matching a conveyor to the loads.

19 ULTRASONIC CLEANERS—*Narda Ultrasonics Corp, 625 Main St, Westbury, LI, NY.* Data sheet provides details on giant size Series 5000 SonBlasters up to 70-gal capacities. Series consists of 23 systems for mass-production cleaning or degreasing, and for expediting metal finishing and chemical processing of many kinds. In addition to complete data on the system, detailed information is given on applications and processes for which this equipment can be used. Tanks of different sizes, submersible transducer arrangements, and metalworking tools are illustrated.

20 ADJUSTABLE STORAGE RACKS —*Palmer-Shile Co, 16019 Fullerton, Detroit 27, Mich.* Illustrated literature describes the standard size P-S 60 Series. Racks consist of a vertical panel and shelving available in three different lengths. Shelves have been tested up to 5000 lbs capacity each.

21 HAND TRUCKS—*Clark Equipment Co, Industrial Truck Division, Battle Creek, Mich.* 6-page illustrated brochure gives specifications, description of operating characteristics, and advantages of high-lift, battery-powered Powrworker stackers in 1500, 2000, 2500, and 3000-lb capacities. Charts indicate lifting heights and lift speeds of all models; drawing show turning radius and dimensions.

22 STEAM CLEANER PHOSPHATING PROCESS—*Malabary Manufacturing Co, 845 92nd Ave, Oakland 3, Calif.* 16-page manual, illustrated with on-the-job photos, discusses the value of phosphating, describes methods of application, explains

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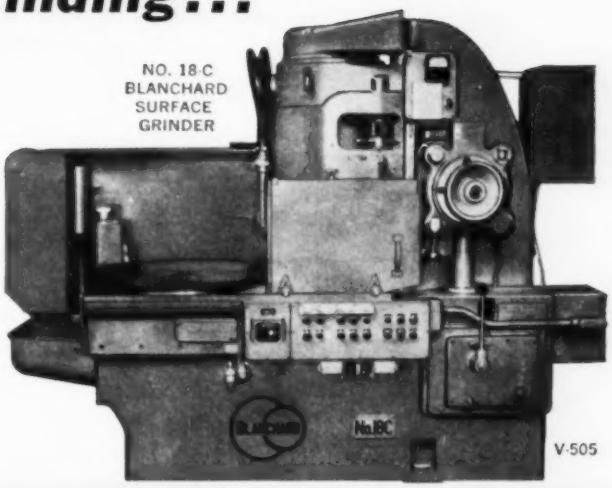

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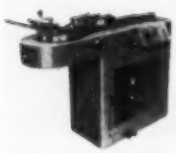
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where the steam cleaner method best fits, cites specific installations, gives figures on operating costs.

23 "NOISE SIMPLIFIED"—*H H Scott, Inc, 111 Powdermill Rd, Maynard, Mass.* New edition of booklet contains information on instrumentation, measurement, analysis, and control of sound.

24 PLATING TEMPERATURE CONTROLS—*Partlow Corp, New Hartford, NY.* 4-page folder presents illustrated description of controls for plating and metal finishing. Covers new pneumatic controls; electrical controls, both non-indicating, indicating and recording; plus line of thermally operated gas controls and thermometers. All controls operate in any of 10 optional temp ranges between −30 and +1100 F.

25 HEATING AND VENTILATING UNITS—*American Air Filter Co, 215 Central Ave, Louisville 8, Ky.* 20-page bulletin 910 contains illustrated, descriptive data on line of Herman Nelson units in 12 sizes with capacities from 600 to 73,000 cfm. Includes information on coil selection for both steam and hot water; capacity tables, air resistance charts, rpm and hp tables, plus section on dimensions and standard arrangements.

PARTS AND MATERIALS

26 HIGH STRENGTH LOW ALLOY STEEL—*American Iron and Steel Institute, 150 E 42nd St, New York 17, NY.* 57-page indexed section of the Steel Products Manual discusses tolerances, inspection, definitions of technological terms, and other related subjects. Covers sheets, strip, plates, structural shapes, bars, and bar size sections.

27 MAGNETIC STARTERS — *Cutler-Hammer Inc, 205 N 12th St, Milwaukee 1, Wis.* 15-page booklet EN-150 describes Three Star line of ac starters in NEMA sizes 0 through 4 for both reversing and non-reversing single phase and squirrel cage motors. Covers component units and elements including magnet coils, overload relays, contact assembly, enclosure types. Ratings and dimensions included.

28 TOOL AND DIE STEEL—*Universal-Cyclops Steel Corp, Bridgeville, Penna.* 12-page bulletin TS-101 gives data on new cold work alloy Lo-Air designed for blanking, forming, coining, and trimming dies as well as for shear blades, spindles, mandrels, stripper plates and many other applications. Features include

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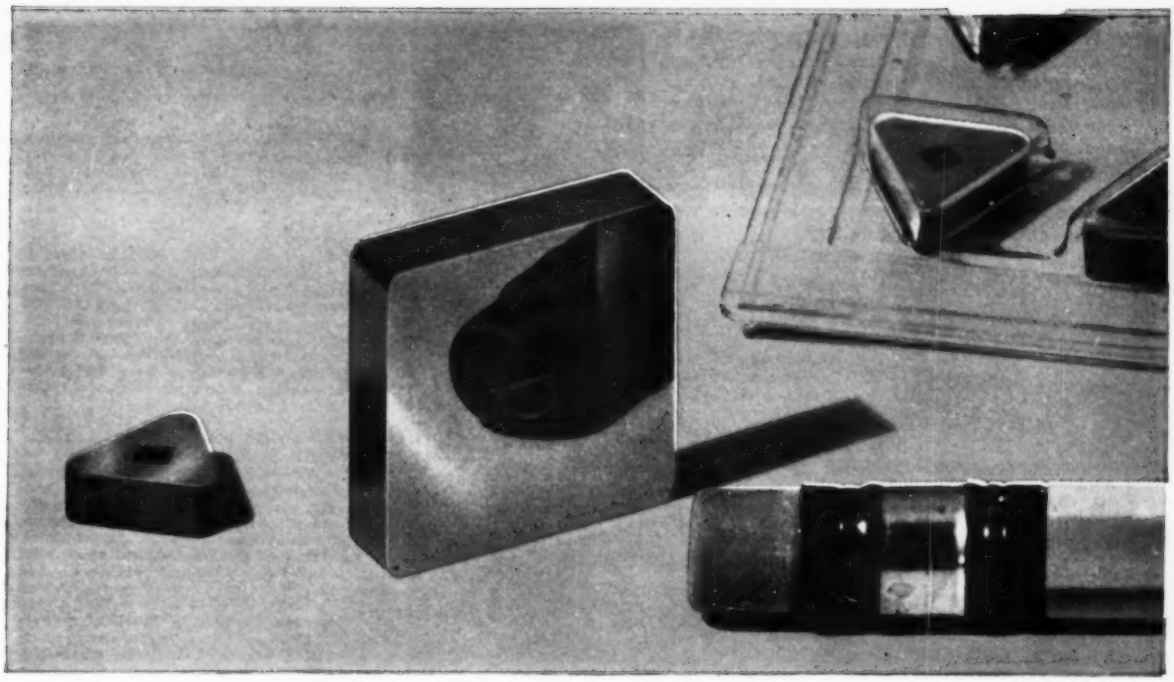

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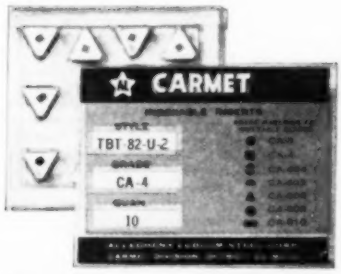

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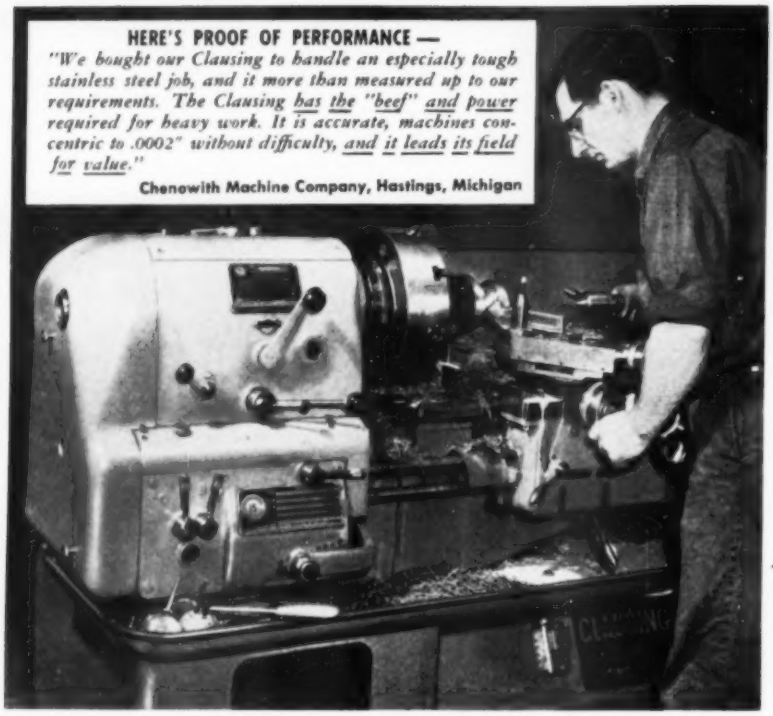
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Have heavy-duty construction. Massively built throughout. Bed ways are induction hardened. Gears in head and quick-change box run in bath of oil. Power feeds are taken from separate feed rod, lead screw is used for thread cutting only. Spindles are high-tensile steel.

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Lathe Capacities: 17" lathe: 54" and 78" centers, 28" swing in gap; 15" lathe: 30" and 48" centers, 24" swing in gap; 13" lathe: 24" and 36" centers, 18" swing in gap.

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high hardenability, heat treating from low temperatures, minimum of distortion, easy machinability. Covers machining, heat treatment, mechanical and fatigue properties.

29 PRECISION GEARS—*General Electric Co, 1 River Rd, Schenectady 5, NY.* 23-page bulletin GEA-6430 illustrates and describes precision gears from less than 1 in. to over 200 in. in dia and with tooth-to-tooth spacing accuracies of two ten-thousandths of an inch. Typical applications pictured, engineering features discussed. Allied products such as various gear testing devices and high-speed flexible couplings are covered.

30 ADHESIVES, COATINGS, SEALERS—*Minnesota Mining & Mfg Co, 900 Bush Ave, St Paul 6, Minn.* 12-page illustrated catalog describes design concepts, applications, and general characteristics of oil soluble elastomeric adhesives; oil resistant; and high strength structural; protective industrial coatings; and sealers in the form of liquids, semi-liquids, and solids.

31 SS TUBULAR PRODUCTS—*Babcock & Wilcox Co, Tubular Products Division, Beaver Falls, Penna.* 8-page bulletin TDC-190 contains technical data on analyses, corrosion and oxidation resistance, high and low temp characteristics, physical and mechanical properties of the family of 18-8 stainless steels.

32 PRECISION-ANNEALED PHOSPHOR BRONZE—*Waterbury Rolling Mills, Inc, Waterbury, Conn.* 4-page brochure describes and pictures the effects of precision-annealing technique on spring temper phosphor bronze sheet and strip. Comparison photos illustrate ability of product to withstand severe bends. Typical applications are pictured and details given on advantageous characteristics of this specially processed material.

33 WIRE ROPE BLUE BOOK—*Macwhyte Wire Rope Co, Kenosha, Wis.* 190-page manual G-16 contains all information pertaining to the subject.

34 WAY BEARING—*Tycho Manufacturing Co, 561 Hillgrove Ave, PO Box 406, La Grange, Ill.* 4-page descriptive brochure illustrates the Tychoway recirculating anti-friction unit designed to give unlimited travel, constant accuracy, and reduction of feed power. Available in varied loads from 2000 to 32,000 lbs in

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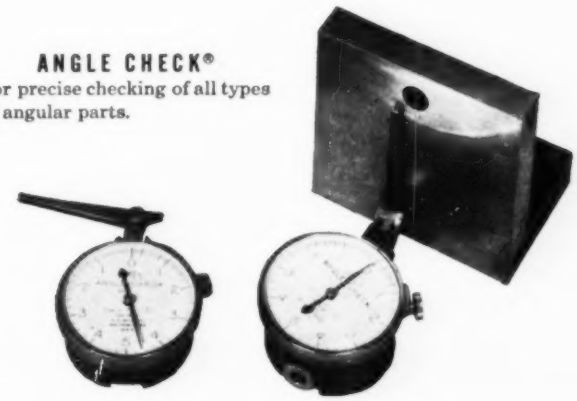

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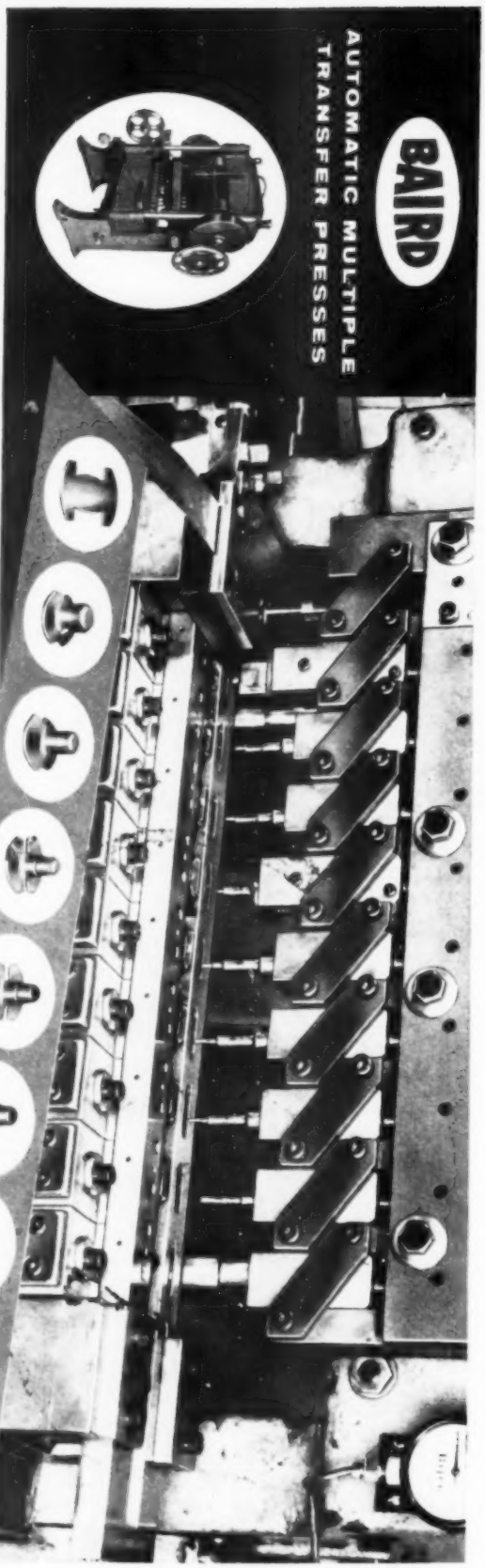

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Eight operations . . . **12,000** pieces per hour

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This related part is made on the same press. To change over, it is necessary only to remove complete die set with assembled punches, dies and transfer slide, and replace with new complete tooling.

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35 VINYL COATINGS — *Pennsalt Chemicals Corp, 3 Penn Center, Philadelphia 2, Penna.* 4-page illustrated folder gives detailed information on strippable, high strength, transparent, flexible, coatings that can be used to protect and moisture-seal aluminum, stainless, copper, brass, bronze, alloys, and plated surfaces, green or wet plaster molds, mockups, splashes, casts, finished and semi-finished parts of metal, wood, and plastic. Coatings are applied with standard paint spray equipment.

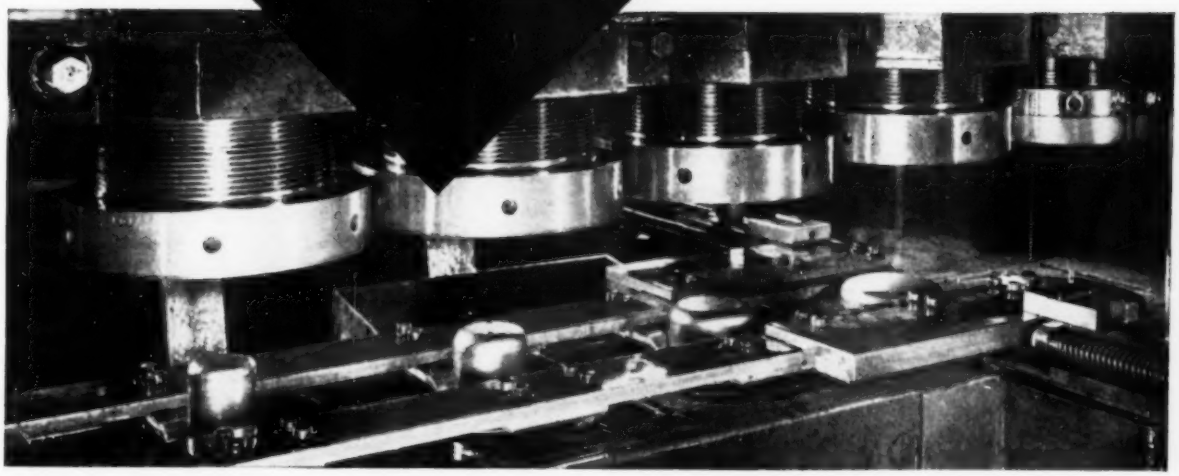
36 BEARING SEALANT — *American Sealants Co, 149 Woodbine St, Hartford 6, Conn.* Brochure describes properties and methods of application of Loctite, a thin liquid plastic that hardens without shrinkage when confined between closely fitting metal parts. Product locks nuts to bolts, seals piping and tubing joints, requires no heat or mixing. Includes case histories, grade selector charts, and usage tables.

37 SHOCK-DAMPENING AND VIBRATION-ISOLATION MATERIAL —*Voss Belting & Specialty Co, Preformed Pad Division, 5645 N Ravenswood Ave, Chicago 26, Ill.* 4-page brochure illustrates applications of Sorbtex, a preformed pad material for use as mounting pads beneath heavy, high-impact machinery, and as machinery components where high-impact energy and vibration must be controlled. Product withstands loads up to 20,000 psi, retains original dimensions under frequent compression and impact for long periods, has small, limited creep, resists oil, steam, and abrasive action.

38 HIGH-PURITY TANTALUM—*National Research Corp, 70 Memorial Drive, Cambridge 42, Mass.* 4-page technical folder describes applications and various forms in which new product is available, including powder for electronic uses, vacuum melting stock, arc-cast ingot for conversion, and tubing, sheet, wire, foil and other mill products. Detailed tables give exact chemical analysis and mechanical and physical properties of material which is of a purity previously unavailable in commercial quantities.

MEL-TROL

at work



To deliver uniform performance between grinds, a drawing or blanking die has to be hard and tough through its whole thickness.

And no matter how well it is designed and heat treated, it can only be as uniform through the center as the bar you make it from . . . and the bar can only be as uniform as the ingot from which it is rolled.

That's why, when you make a die from Carpenter MEL-TROL air hardening die steels—such as No. 484 and No. 610 —you *know* you're going to get predictable performance. The high quality of MEL-TROL die steels is guarded by a system of the most advanced and accurate quality controls ever used in steel making.

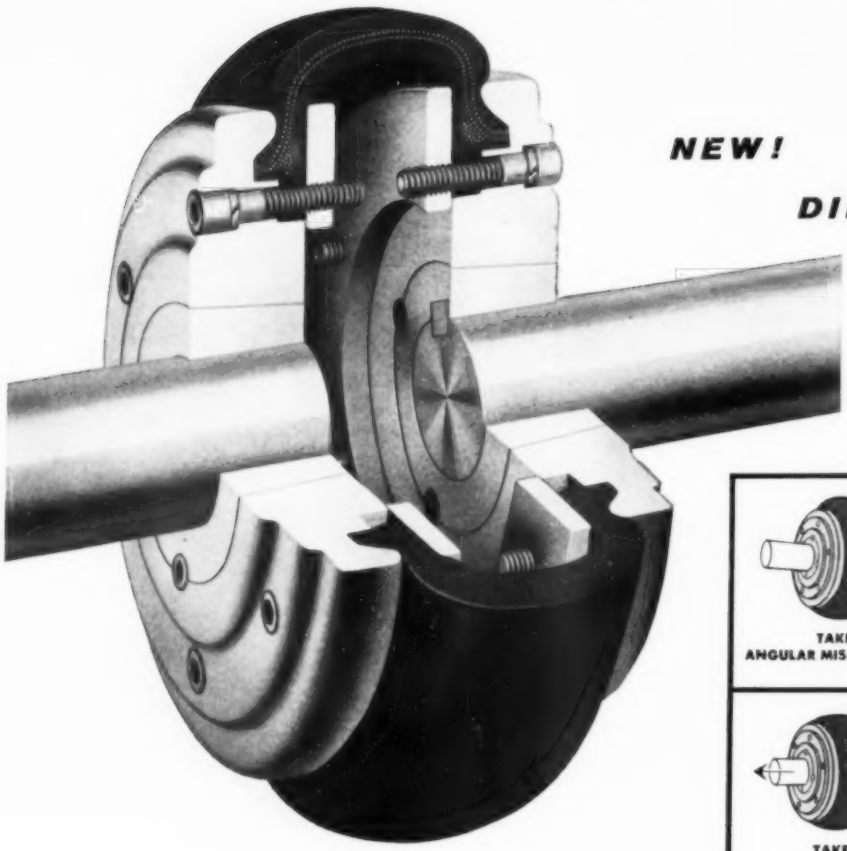
And an exclusive Carpenter-patented mold produces ingots with greater uniformity through the center than any others made on a production basis today.

Why don't you try Carpenter MEL-TROL quality tool and die steels? Call your Carpenter representative and place your order today.

Carpenter STEEL

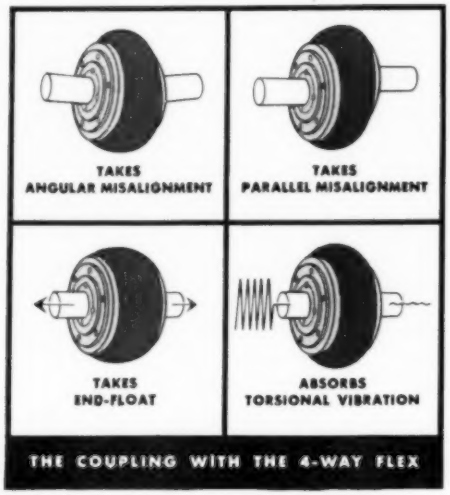
The Carpenter Steel Company
Main Office and Mills, Reading, Pa.
Alloy Tube Division, Union, N. J.
Webb Wire Division, New Brunswick, N. J.
Carpenter Steel of New England, Inc., Bridgeport, Conn.

CIRCLE 305 READER SERVICE CARD



NEW!

DIFFERENT!



DODGE

Para•flex

FLEXIBLE CUSHION COUPLING

THIS coupling "swallows up" shaft misplacements. It automatically compensates for end-float, parallel misalignment, angular misalignment *or any combination of all three.* Moreover, it cushions the stresses of shock loads. And it absorbs torsional vibration—reducing noise and protecting machinery from vibration's destructive forces.

Here is a new type of performance—made possible by the development of a tire-like flexing element. Synthetic tension members, bonded together in rubber, give this element the stamina and dependability of modern, high-speed, high-load, shock-absorbing truck tires—and the ability to respond magically to all manner of changing shaft conditions.

Para-flex takes minimum space on the shaft. Mounting is simplified through the use of standard Taper-Lock bushings—no reboring, no machining. Safety is promoted by flush design; there are no protruding parts. No lubrication is required, no periodic inspection. And since the flexible member is molded with a transverse split, it can be replaced *without moving either the driver or driven machine.*

Para-flex Couplings are stocked by Dodge Distributors in popular transmission sizes. They are available from factory stock in capacities up to 825 hp at 1200 rpm. Call your distributor for early delivery to *make your own test.* You'll witness something revolutionary!

DODGE MANUFACTURING CORPORATION, 100 Union, Mishawaka Ind.

DODGE

of Mishawaka, Ind.

CALL THE TRANSMISSIONEER—your local Dodge Distributor. Factory trained by Dodge, he can give you valuable help on new, cost-saving methods. Look in the *white* pages of your telephone directory for "Dodge Transmissioneer."

Albert T Blackburn, works manager of the Cincinnati Milling Machine Co, has been elected a vice president of the company

Harry C Soukup (left) has been appointed general manager and **Edward F Woytych** works manager of Giddings & Lewis Machine Tool Co's Fond du Lac Division. Mr Soukup had been works manager and acting general manager since last April. Mr Woytych was previously assistant works manager

NAMES IN THE NEWS...

W F Babcock, executive vice president of Foote-Burt Co, Cleveland, has been elected president to succeed **T H Doan,** head of the company for the past 26 years, now named board chairman.

Edwin F Shelley has been elected president of USI Robodyne, a division of US Industries, Inc. Division, located in Silver Spring, Md, is engaged in design, engineering, and manufacture of advanced automated systems and devices for industry and government. In addition to his new responsibility, Mr Shelley will retain his title and duties as director of advanced programs at USI.

August C Esenwein, vice president and general manager of Convair's Fort Worth plant, has been appointed executive vice president of Convair, Division of General Dynamics Corp, San Diego. **J G Zevely,** director of contracts and commercial sales, has been named vice president in charge of these activities, and **Frank W Davis,** chief engineer at the Fort Worth plant, is new vice president and general manager there.

George P Maurer, assistant chief engineer, gear technology and industrial gearing for the Falk Corp, Milwaukee, has been promoted to director of gear engineering. **W Stephen Richardson** has been named chief engineer, and **Edward J Wellauer** director of research and development.

Dan O'Leary has been elected president of Controls Co of America (Canada) Ltd, Cooksville, Ont, subsidiary of Controls Co of America. Mr O'Leary was vice president and general manager, prior to this appointment.

Lawrence C Rodgers Jr has been appointed product manager, special metals fabrication, for Pfaudler Co, a division of Pfaudler Permutit Inc.

Jack B Laramy has been named manager of sales of the Worthington Corp, Harrison, NJ. He has been serving as eastern regional sales manager.

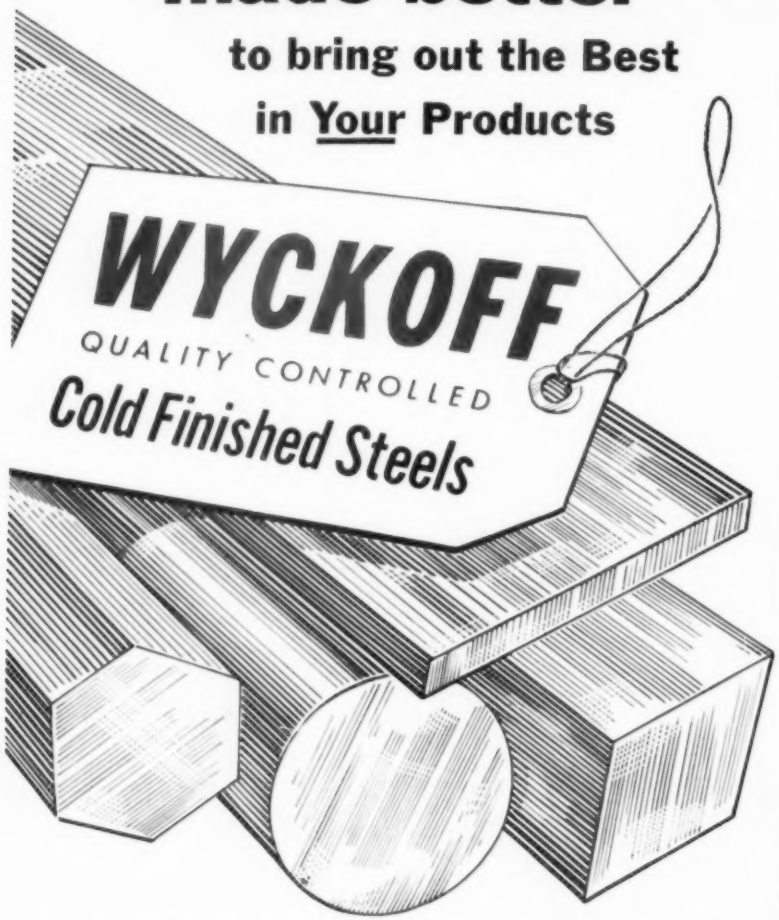
D G Gilmore, manufacturing manager of Chance Vought Aircraft, Dallas, has been appointed director of production. **J R Clark,** chief engineer, aircraft projects, is new di-

Paul W Norris, vice president and general manager of Denison Engineering Division of American Brake Shoe Co, has been named president of that division at Columbus, Ohio

James H Daley (left) has been named sales manager of the Machine Tool Division of Pratt & Whitney Co, West Hartford, Conn. Formerly district manager of the Cincinnati office, he takes over the post held by **James D Allan** who will remain as a sales consultant until his retirement in July

made better

to bring out the Best in Your Products



Constant quality and metallurgical control throughout every step in the processing of Wyckoff Cold Finished Steels is your assurance of:

- *Ultimate Machinability*—in any type of screw machine or lathe
- *High Production Rates*—of closely dimensioned, accurate parts
- *Longer Tool Life*—requiring fewer tool grinds; minimum down time
- *Superior Surface Finish*—insuring close control of finished part
- *Physical Properties*—to meet your specifications

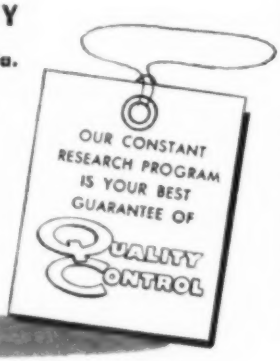
Let our metallurgists work with you in selecting the best analyses for your specific requirements.

SPECIALISTS IN COLD FINISHED STEEL FOR OVER 50 YEARS

WYCKOFF STEEL COMPANY

GENERAL OFFICES:
Gateway Center, Pittsburgh 30, Pa.
Branch Offices in Principal Cities
Works:
Ambridge, Pa., Chicago, Ill., Newark, N. J., Putnam, Conn.

WYCKOFF STEEL PRODUCTS • Carbon, Alloy and Leaded Steels • Turned and Polished Shafting • Turned and Ground Shafting • Large Squares • Wide Flats up to 12¾" x 2¼" and 14" x 1¼" • All types of Furnace Treated Steels including Carbon Corrected Steels



NAMES IN THE NEWS...

rector of engineering, and **Forbes Mann**, director of long range planning, will head sales and service.

J Vance Foster has been promoted to applications engineering manager of Potter & Brumfield, Inc, Princeton, Ind, subsidiary of American Machine & Foundry Co. He was formerly applications laboratory supervisor.

William B Ilko, sales manager of the American Chain Division of American Chain & Cable Co, York, Penna, has been appointed, in addition, sales manager of the Wright Hoist Div, York, Penna.

Ralph M Trent, executive vice president of Pangborn Corp, Hagerstown, Md, manufacturer of Rotoblast, and blast cleaning abrasives, has been elected president of the company. He succeeds the late **Victor F Stine**

George Ramsden has been appointed assistant general manager for Link-Belt Co's North Central Division with headquarters at the company's Minneapolis plant. He was formerly mining sales specialist at the company's Pershing Road plant in Chicago.

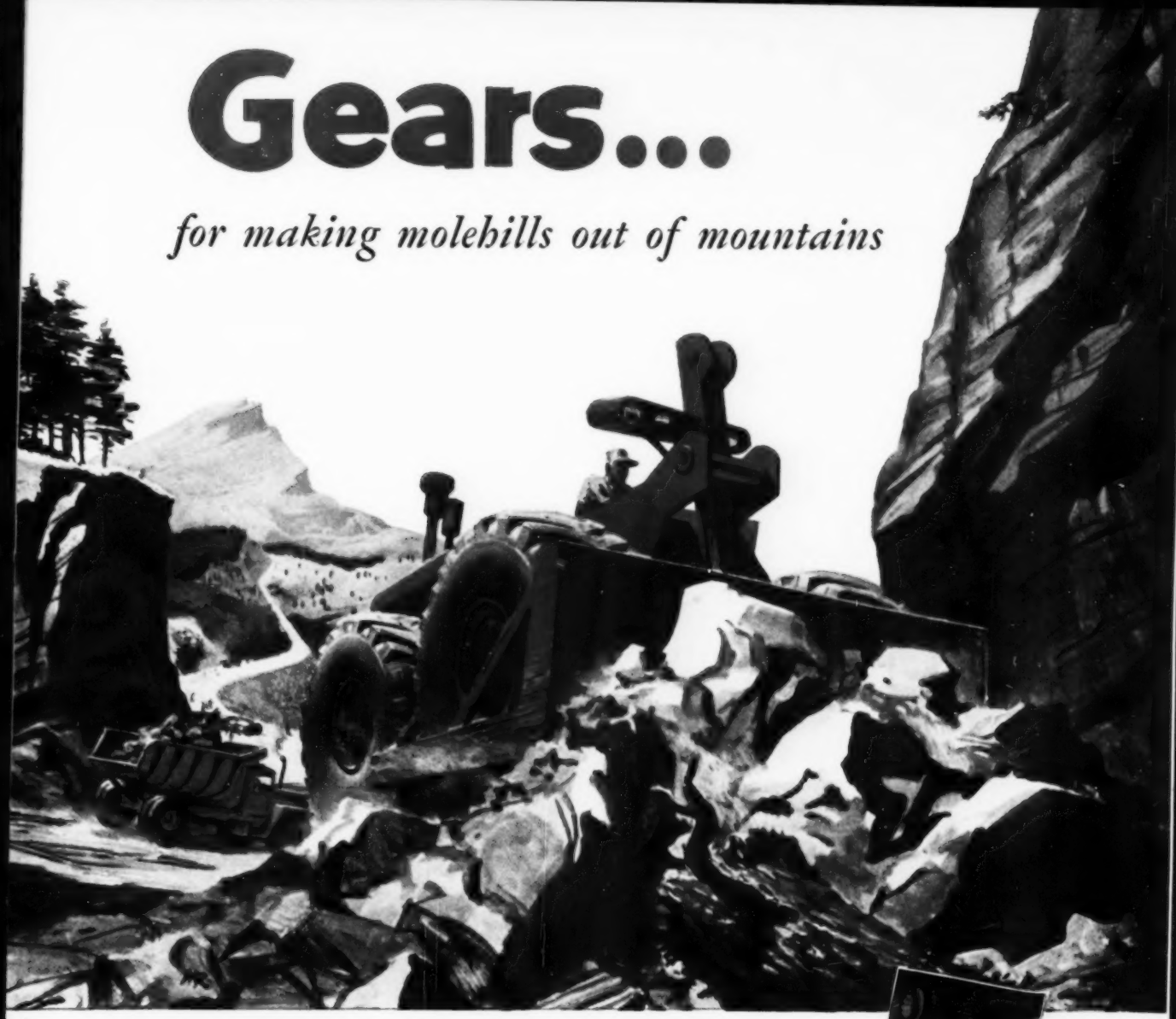
Ralph T Mueller has been appointed midwest regional sales manager for the Socket Screw Division of the Bristol Co, Waterbury, Conn. He has been St Louis district representative for the past seven years.

James H Dodge has been named sales manager of specialty steels of Latrobe Steel Co, Latrobe, Penna. He has been regional sales manager of the Detroit branch for the past 14 years.

Jack M Cherne has been appointed director of engineering at Vard, Inc, Pasadena manufacturer of precision control mechanisms for aircraft, mis-

Gears...

for making molehills out of mountains



It is hard to imagine worse working conditions, and that is the very reason why the manufacturers of so many kinds of road building equipment install "Double Diamond" gears. Wherever the going is especially rough, wherever gears must give uninterrupted service on harsh, time-table schedules, you'll find our gears at work.

For low installed cost, for true operating economy and performance, and for buckling down to the hardest kind of service—nothing beats "Double Diamond."

Our salesmen are experienced gear engineers. Why not talk to one about your gear requirements?

May we send you a copy of this comprehensive catalog on the many gear types in which we specialize?

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MANUFACTURING COMPANY
RICHMOND, INDIANA

GEARS FOR AUTOMOTIVE, FARM EQUIPMENT AND GENERAL INDUSTRIAL APPLICATIONS
GEAR-MAKERS TO LEADING MANUFACTURERS

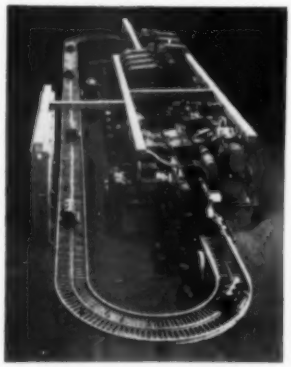
CIRCLE 308 READER SERVICE CARD

STEEL *from Wheelock, Lovejoy* BULLETIN

W-L DETROIT For the first time, HY-TEN D-2 air hardening steel now available here in rounds, squares, flats and billets. Also a fine stock of standard alloy grades, especially A-8620, as well as all HY-TEN grades. Excellent service from our new warehouse.

W-L CHICAGO Steady demand for "B" No. 3X for flame-hardened parts such as boring bars. Good stocks of HY-TEN AIS — the best carburizing alloy steel, and freest machining available today—a new W-L exclusive!

W-L CINCINNATI This 23-station Avey Line-O-Dex transfer machine, designed and built by The Avey Division of Motch & Merryweather Machinery Co., Cincinnati, Ohio, is equipped with spindles made of our HY-TEN "B" No. 2. This grade was chosen for its great tensile strength (100,000 P. S. I. in the natural condition), toughness, and fine wearing qualities.



W-L CAMBRIDGE We are now distributing FLEXANGLE, the easy-to-erect structure assembly for all types of racks, shelves, platforms, etc. It's completely universal and low in cost — can be used anywhere, by anyone, for any storage purpose.

W-L HILLSIDE Our stock of flat and square sizes in HY-TEN M Temper Oil Hardening Steel can save you time and money in your tooling program. HY-TEN "B" No. 3X pre-heat treated in rounds, squares and flats available in a wide range of sizes. Billets on hand for hammer forging in all grades of HY-TEN.

W-L CLEVELAND Excellent stock of brake die flats and squares. Also many sizes up to 16" x 18" in HY-TEN Mold Steel. Excellent deliveries.

W-L BUFFALO A wide range of rounds and hexagons in cold drawn AISI leaded and non-leaded A-4140. Also many sizes of the new "B" No. 3X-40 in rounds and hexagons.

Write our Cambridge office today for your *free* Wheelock, Lovejoy Data Sheets. They'll give you complete technical information on grades, applications, physical properties, tests, heat treating, etc.

WHEELOCK, LOVEJOY & COMPANY, INC.
136 Sidney Street, Cambridge 39, Mass.

AMERICAN STEEL WAREHOUSE ASS'N

AGENTS: Southern Engineering Company, Charlotte, N. C.; Sanderson-Newbould, Ltd., Montreal & Toronto

NAMES IN THE NEWS...

siles, and nuclear reactors. Formerly project engineer in charge of helicopter development and flight test at Hughes Aircraft Division, **Mr Cherne** replaces the late **Walt Schindler,** vice president in charge of Vard engineering.

Dr Albert Muller, assistant to the president of Air Reduction Sales Co, division of Air Reduction Co, has been appointed vice president of the division

OBITUARIES

Ralph S Howe, president of New Britain Machine Co, New Britain, Conn, died recently. He had served in various executive capacities with the company for many years, including vice president and executive vice president. During the Korean crisis Mr Howe spent a year in Washington as director of the Metalworking Equipment Division of the National Production Authority and then as assistant to the administrator of NPA.

Van Winkle Todd, 66, board chairman of the Hanson-Van Winkle-Munning Co, Matawan, NJ, manufacturer and supplier of metal finishing equipment, died Jan 15.

It's 3M MAGIC!

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TAPEnology saves "face"... polished metal stays blemish free!

Forming and handling polished metal sheet can be speeded . . . rejects almost eliminated . . . by using "SCOTCH" Brand Masking Paper and tight-holding "SCOTCH" Brand Masking Tape. Applied prior to forming operations, such protective masks guard polished surfaces against scratches, die marks, staining—may be left on right through shipping if desired, yet removes easily and cleanly. Application can be kept up to production line speed by using "SCOTCH" Brand Apron Tapers to apply the tape to one or both edges of the paper as it is pulled from the roll. Fast, easy, economical . . . the cost-saving way to increase handling speeds on flat, polished metal stock.

Looking for Cost Saving Short Cuts? No matter what your metal-working operations include, chances are "TAPEnology" can help you do it faster, better, at less cost. Ask your nearest "SCOTCH" Brand Tape Distributor for complete information, or write: 3M Co., St. Paul 6, Minn., Dept. MA-29.

When tape costs so little, why take less than "SCOTCH" Brand?

"SCOTCH" is a registered trademark for the pressure-sensitive adhesive tapes of 3M Co., St. Paul 6, Minn. Export: 99 Park Ave., New York 16. Canada: London, Ontario.

MINNESOTA MINING AND MANUFACTURING COMPANY
. . . WHERE RESEARCH IS THE KEY TO TOMORROW

3M COMPANY

THE MOST COMPLETE LINE OF SPRING MAKING MACHINERY . . .

DESIGNED AND BUILT FOR THE METAL WORKING INDUSTRY

Sleeper & Hartley produce a complete line of spring-making machinery serving the basic metal working industries:

- Fabricated Metal Products
- Instruments
- Ordnance
- Furniture and Fixtures
- Transportation Equipment
- Electrical Machinery
- Machinery (except electrical)
- Miscellaneous Products

Quality and dependable service during 47 years of Sleeper & Hartley production have given the customer satisfaction for which we constantly strive.

No. 0 UNIVERSAL SPRING COILER, ESCAPEMENT TYPE. Series 720 — 73" Model.

This newest, versatile machine in the exclusive S&H escapement line incorporates the most advanced design engineering in the field, to give greater wire feed range and high speed production. Its many features include extremely accurate wire feed and controls for fine precision adjustment. Inertia is minimized since the only thing that starts and stops with this type feed mechanism is the wire itself.

Write for latest information . . .

SLEEPER & HARTLEY, INC., BOX 1249, WORCESTER 1, MASS., U.S.A.

NEW BOOKS...

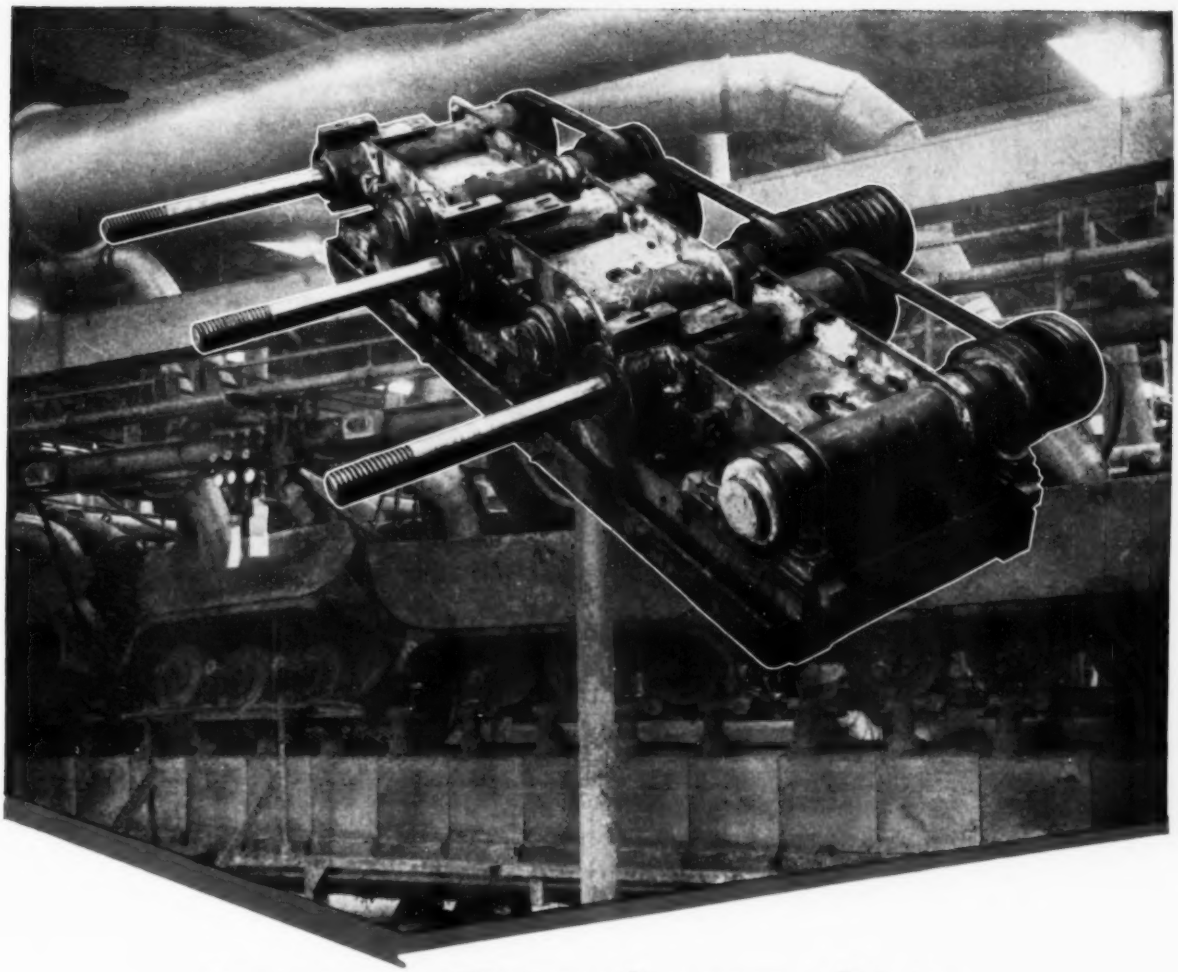
THE MAKING, SHAPING AND TREATING OF STEEL — *Seventh Edition — Published by United States Steel Corporation, Office Service-Stores, 525 William Penn Place, Pittsburgh 30, Pa. 1048 pages. Size, 8¼ x 11 in. Price, $7.50*

Here is the most complete one-volume reference work relating to the iron and steel industry. Prepared by a team of 200 U S Steel technical representatives, the new edition offers users and makers of steel a comprehensive summary of present-day theory and practice of iron and steel production, from raw materials to finished products.

Starting with a presentation of some of the fundamental principles of chemistry and physics, the book deals with refractories; iron ores; fluxes and slag; addition agents; steel scrap; early iron- and steel-making methods; modern blast-furnace practices; the modern pneumatic, open hearth, electric furnace, duplex and triplex steel-making processes; steel and iron castings, including roll manufacture; heating methods; rolling mills; rolling and forging practices; steel conditioning; protective coatings; heat treatment; mechanical testing, and gages.

Extensive discussions are devoted to the manufacture and properties of carbon and alloy steels, and the products made from them. These include blooms, slabs and billets; rails and structural sections; plates, merchant bars, and hot strip mill products; cold-reduction mill products; galvanized products; tin plate and terne plate; circular shapes; axles; shafts; wire; tubular products; electrical sheets; and corrosion-resistant and heat-resistant products.

"I understand you've been advising one of my employees."



Here's a Bearings, Inc. idea that saved our customer $3,000 in labor, maintenance and parts in 7 months

Only an authorized bearing distributor such as Bearings, Inc., with the experience and facilities we have at our disposal, could have designed and supplied the special housings that hold the flinger sealed bearings that now have effectively solved this difficult bearing maintenance problem.

A well known automotive stamping plant designed and built this tandem buffing head (shown above) for its own use. Due to the extremely high concentration of metal dust from the buffing and polishing wheels conventional bearings had a very short life. Over 300 bearings were purchased in 7 months. Downtime due to bearing failure was very costly. The actual labor and material cost of replacing the bearings during this period exceeded $3,000! Since the new bearing units designed by Bearings, Inc. (shown enlarged) were installed, no bearing failures have occurred and no replacements have been installed.

Remember Bearings, Inc. when you need replacement bearings — Get "factory fresh" bearings of latest design and manufacture. We are *authorized* to sell most famous makes of bearings. We sell *only* those we are authorized to distribute. Call the Bearings, Inc. branch nearest you!

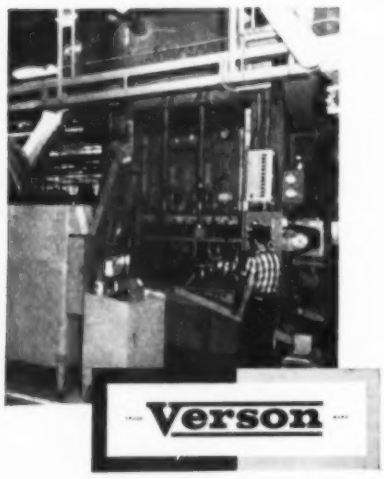
Providing bearing service in the North ▸ **BEARINGS, INC.**

OHIO: Akron • Canton • Cincinnati • Cleveland • Columbus • Dayton • Elyria • Hamilton • Lima • Lockland • Mansfield • Toledo • Youngstown • Zanesville
INDIANA: Ft. Wayne • Indianapolis • Muncie • Terre Haute • **PENNSYLVANIA:** Erie • Johnstown • Philadelphia • Pittsburgh • York
WEST VIRGINIA: Charleston • Huntington • Parkersburg • Wheeling • **NEW JERSEY:** Camden
NEW YORK: Buffalo, Balanrol Corp. • **MARYLAND:** Baltimore • **DELAWARE:** Wilmington

and in the South ▸ **DIXIE BEARINGS, INC.**

FLORIDA: Jacksonville • **GEORGIA:** Atlanta • **KENTUCKY:** Louisville • **LOUISIANA:** Baton Rouge • New Orleans
N. CAROLINA: Charlotte • Greensboro • **S. CAROLINA:** Greenville • **TENNESSEE:** Chattanooga • Kingsport • Knoxville • Nashville

Are you "whittling" out metal parts that could be IMPACT MACHINED at a fraction of the cost?



If you manufacture machined parts by cutting away sections of a chunk of steel until only a piece of the required size and shape remains, you may be missing an opportunity to substantially reduce your manufacturing costs.

The opportunity is Impact Machining.

Impact Machining is the practical application of the principles of cold extrusion to the manufacture of a wide variety of piece parts that formerly had to be made by metal removal processes or hot forged. In this process, suitably tooled presses cold flow metal into the required shape with little or no conventional machining . . . little or no scrap.

We urge that you investigate the cost cutting advantages of Impact Machining. Ask to have a Verson Impact Machining specialist go over your requirements with you or, for specific recommendations, send drawings and specifications on parts you must produce.

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NEW FILMS...

NMTBA MOTION PICTURE FILMS. *Published by National Machine Tool Builders Assn, 2071 E 102 St, Cleveland 6, Ohio. 26 pages. No charge.*

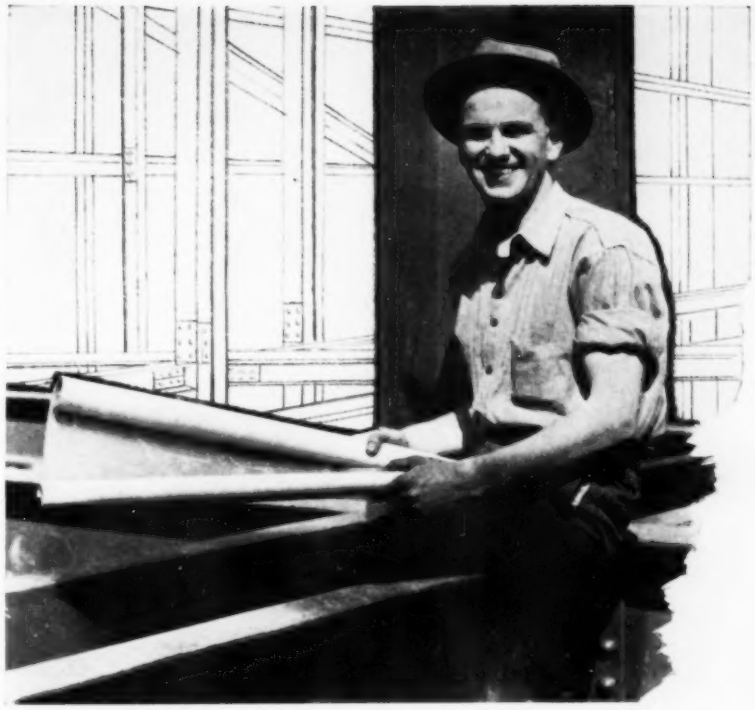
Of the 147 films listed in this booklet and dealing with machine tools and machining operations, 84 are color. All are available without charge from the companies producing them. Many of the films deal with specific machining operations, others are of the institutional type and tell the story of the part played by machine tools in improving our standard of living.

•

MOTION PICTURE FILM CATALOGUE OF THE PLASTICS INDUSTRY. *Available from the Society of the Plastics Industry, Inc, 250 Park Ave, New York 17, NY.*

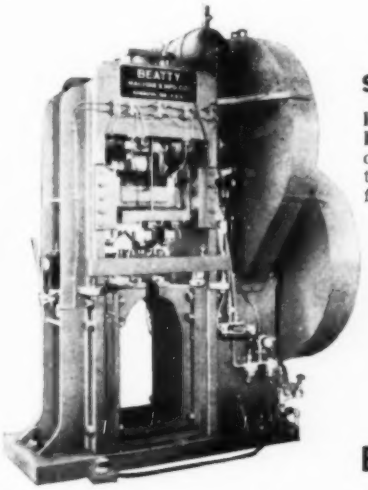
This 20-page bulletin lists the films that have been produced on various phases of the plastics industry and are available for public showing. Subjects vary from raw materials, through manufacturing processes, to the finished product and its applications. A brief description is given on each film, the terms, conditions, and the company from which it may be obtained.

"Personally, I don't like calling you on the carpet, Hasse . . . you have the dirtiest shoes in the plant!"



BEATTY EQUIPMENT IN YOUR SHOP MAKES HIS JOB EASIER, TOO!

On the job, erecting the structural steel which you fabricate, the precision, speed and accuracy of Beatty Machines pays off big for your customers, too! That's because Beatty equipment is engineered for maximum accuracy and speed in heavy metal-working — punching, slotting, bending, flanging, forming. Beatty machines help you deliver the goods on time, speed fabrication by reducing set-up time and material handling. The new Beatty No. 7 Detail Flange Punch, for example, flange-punches I-beams in only two passes where ordinary equipment requires four passes. Look to Beatty for heavy metal-working equipment — a complete line of punches, presses, shears, bulldozers.



SPECIFICATIONS

BEATTY NO. 7 DETAIL FLANGE PUNCH — 100-ton cap., mechanically driven guillotine-type. Punches 1¼" hole through 1" mild steel and handles beams from 6" to 36".

Write For Full Details

BEATTY MACHINE & MFG. CO.
948 150th St., Hammond, Ind.

CIRCLE 314 READER SERVICE CARD

Another Tinnerman Original...

Nut-in-a-cage eliminates welding or staking... **SPEED GRIPS**® hold themselves on panels!

Wherever you require a heavy-duty, multi-thread, self-retaining fastener, a Tinnerman SPEED GRIP Nut Retainer answers the need, holds down assembly costs.

SPEED GRIPS snap into place... some into panel holes... others over panel edges. No special tools or skills required. Spring-steel fingers grip the panel, yet let the nut float to compensate for normal panel-hole misalignment. Welding, staking and clinching are eliminated. SPEED GRIPS can even be applied after panels have been finished, avoiding paint-clogged threads.

SPEED GRIPS are available in a wide range of sizes and types, including front-mounting nut and bolt retainers for hard-to-reach or blind locations.

See your Sweet's Product Design File, section 8-T for data on these and other SPEED NUT Brand Fasteners. Your Tinnerman representative has complete information and samples. If he isn't listed under "Fasteners" in your Yellow Pages, write to:

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Dept. 12 • P. O. Box 6688 • Cleveland 1, Ohio

TINNERMAN
Speed Nuts®

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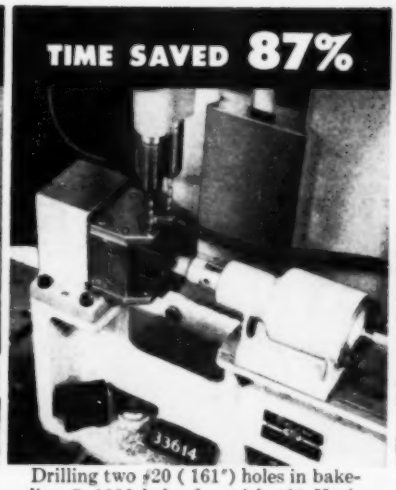
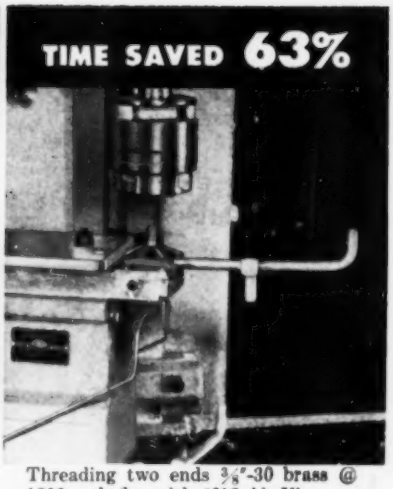
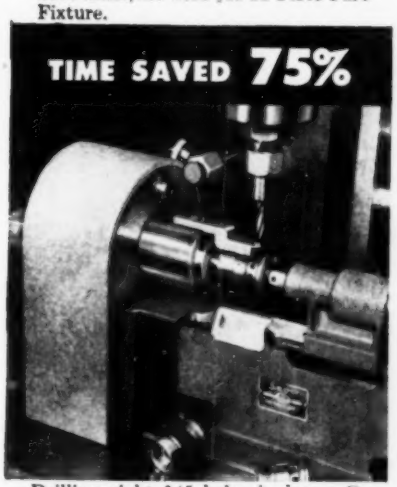
Tapping three $\frac{5}{16}$"-18 holes in steel @ 1800 holes/hr. with #X-11 Piece Part Fixture.



Drilling two #20 (161") holes in bakelite @ 1950 holes/hr. with #21 Horizontal Clamping Fixture.



Threading two ends $\frac{3}{8}$"-30 brass @ 1800 ends/hr. with #612 Air Vise.



Drilling eight $\frac{3}{16}$" holes in brass @ 1920 holes/hr. with #16 Vertical Indexing and Clamping Fixture.

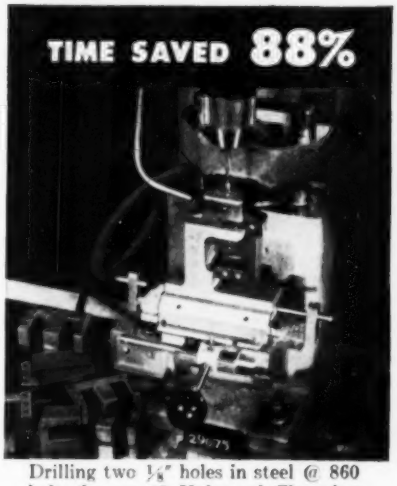
can you take advantage of these savings

The average Snow machine pays for itself *completely* in 300 to 600 hours. That's only 9 to 17 weeks of 35 hours/week. A Snow machine can be idle 85% of the time and still pay for itself in one year.

Such savings are possible because Snow machines give two to four times the hourly production of non-automatic machines. 28 standard air-operated fixtures permit minimum tooling for each job. On your next job, let us show you what the Snow method can do. Send us your samples and prints.

Drilling $\frac{1}{16}$" hole through brass @ 2600 holes/hr. with #15 Vertical Indexing Fixture.

Tapping two 4-40 holes in steel @ 4400 holes/hr. with #18 Horizontal Indexing Fixture.



Drilling two $\frac{1}{4}$" holes in steel @ 860 holes/hr. on #9 Universal Clamping Fixture.

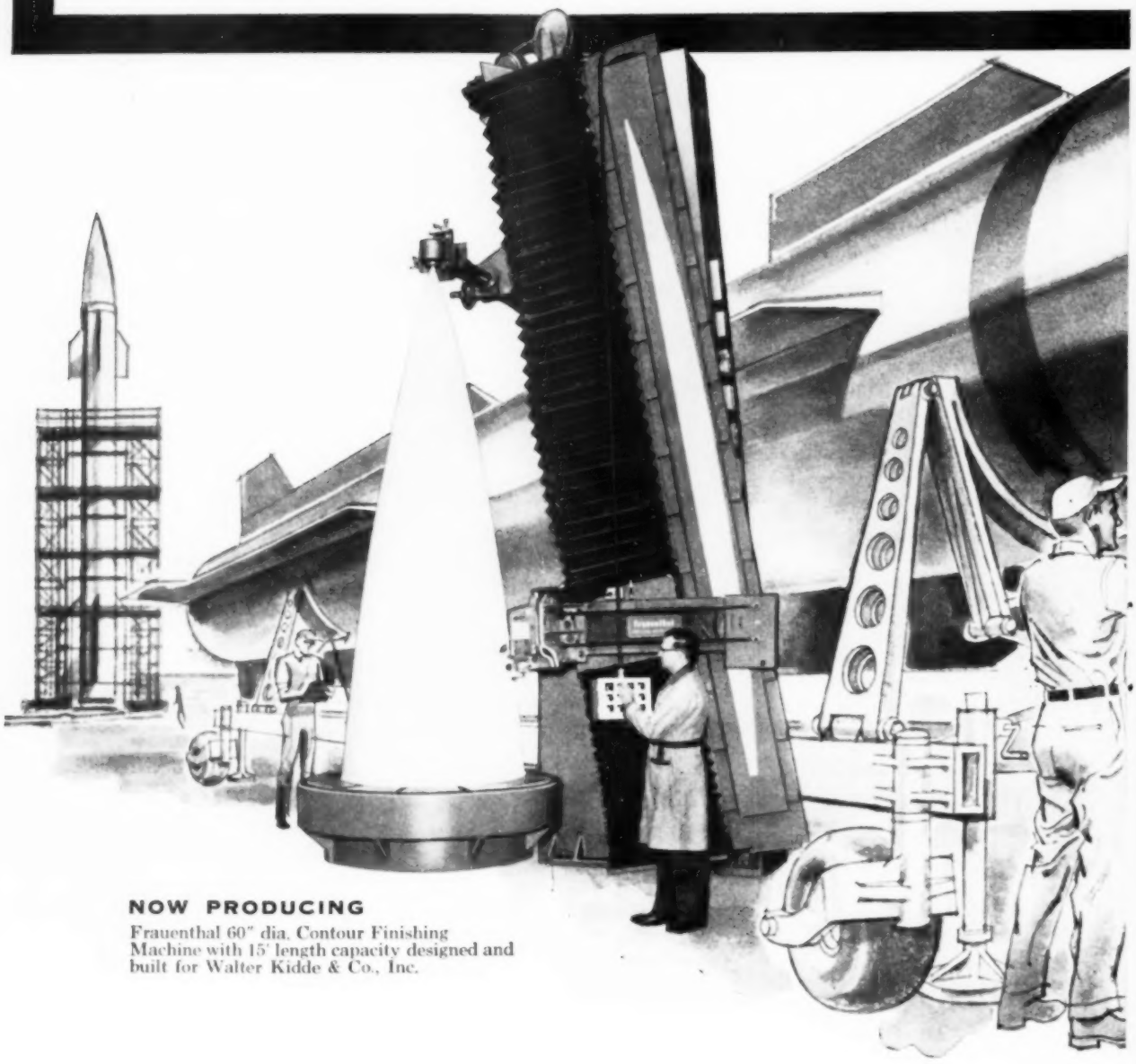
Snow Manufacturing Company
Dept. A, 435 Eastern Avenue
Bellwood, Illinois (suburb of Chicago)

SNOW

master fixtures save dollars and days in tooling costs.

NEWS!

FRAUENTHAL BREAKS ANOTHER ROCKET-AGE MACHINING BARRIER



NOW PRODUCING

Frauenthal 60" dia. Contour Finishing Machine with 15' length capacity designed and built for Walter Kidde & Co., Inc.

Now... machining and grinding nose cone and radome contours for aircraft and I. C. B. M. re-entry missiles . . . FRAUENTHAL Rocket-Age machines are here!

NOW PRODUCING

Frauenthal 36" Tracer Controlled Contour Grinder at work on a typical radome shape — also available in larger sizes.

NOW PRODUCING

Frauenthal Precision Contour Turning and Finishing Machine. Producing to accuracy of ± .0005 over entire 60" diameter contoured surface, with 4 RMS maximum finish on re-entry nose cone.

Developed for AVCO Research and Advanced Development Division on the Titan program.

Frauenthal is doing it *right now* — contour machining, grinding and micro-finishing metal, fiber glass and ceramic nose cones for America's Space-Age missiles.

These creatively designed machines can generate nozzle throat contours for rocket motors, lay up or wind resinoid bonded material on formed mandrels, contour turn and grind mandrels or other difficult-to-work shapes and materials.

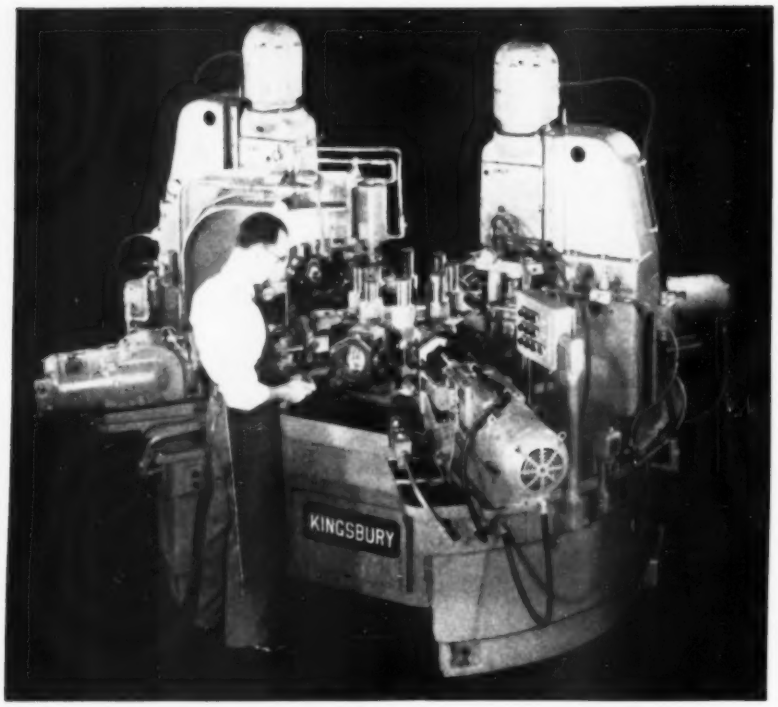
Contact Frauenthal now for forward-thinking machine designs. You'll get advanced engineering that *anticipates* your current and future requirements. All to help you profitably BREAK THROUGH in your field of operations.

FRAUENTHAL

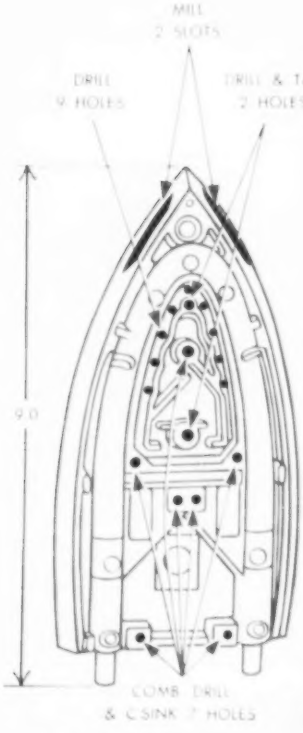
DIVISION

THE KAYDON ENGINEERING CORP.

MUSKEGON, MICHIGAN, U. S. A.



22-spindle Kingsbury mills 2 slots, drills 18 holes, taps



DIE CAST ALUMINUM FLAT IRON SOLE PLATE

Five horizontal and two vertical units operate 22 tools. The vertical units mill the slots with six-inch cutters. Each cutter rotates so the thrust is down. The slots, incidentally, make it easier to iron around buttons.

Four horizontal units drill 11 holes and combination drill and countersink 7 holes. Bushings guide these tools. The last unit taps two of the holes.

A 30-inch index table holds eight work fixtures. Each has power clamping and automatic unclamping through use of an air cylinder. The point of the work is up, and clamping is outward against a fixed front plate. Gross production is 520 parts per hour.

Production men praise our machines. "Can't remember when we had trouble with them."

"Our Kingsburys do a nice job for us."

"Hardly ever get a bad part."

We think we earn those compliments. Forty years behind us and we still work hard on every machine we build. Good basic design, rugged construction, test runs before shipment — all that sort of thing really pays off.

For high production at low unit cost, ask to have a representative call and talk over your jobs. Let him get you a specific proposal. If we say we can do it, we can do it. Kingsbury Machine Tool Corp., Keene, N. H.

KINGSBURY MULTI-UNIT AUTOMATICS

Secondary operations on screw machine parts

This 7-spindle Kingsbury operates on three parts for electric typewriters. It drills, chamfers, taps and burr reams 430 parts per hour (gross).

A 12-inch index table holds eight work fixtures with automatic clamping, unclamping and ejection. Different jaws and work locators are used for the three parts.

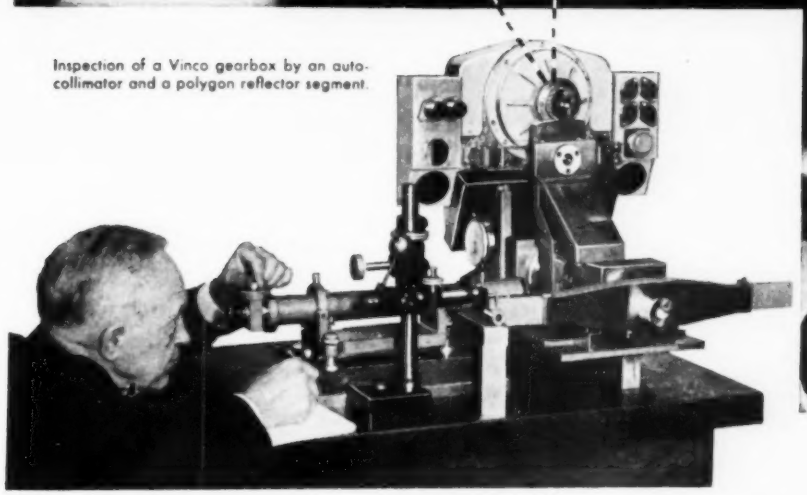
Part **A** uses all seven units. Six horizontal units operate on two cross holes 90° apart. A vertical unit burr reams the center hole. Parts **B** and **C** each use only three units.

Typical Kingsbury jobs in eight industries

These parts are used in a food mixer, water meter, automatic transmission, dial telephone, plumbing, air conditioner, rifle, and typewriter. All cost less on Kingsburys.

MISSILES GEARED TO A STAR BY VINCO

Accuracy of 3.6 seconds of arc.
Gear ratio 2,584,800 ÷ 1.



Inspection of a Vinco gearbox by an autocollimator and a polygon reflector segment.

Test stands for missile guidance systems include a gearbox built by Vinco to isolate the gyro system from the earth's rotation. Driven by an 1800 RPM synchronous motor, with a gear head stepdown to 1RPM, it produces an output motion of one turn in one sidereal day. Output accuracy limit of 3.6 seconds of arc reflects the action of 8 Vinco gears and 9 precision ball bearings. It is equivalent to .00018″ error of motion at the pitch line of a 32 diametral pitch, 20° pressure angle, 20.625 pitch diameter output sector.

Such accuracy is a must for checking the error or drift of gyroscopic and inertial guidance equipment. The gears in the sidereal rate test gearbox were ground and inspected on Vinco equipment by Vinco craftsmen. This personnel and equipment are available for producing gears of the same high precision for you.

The Vinco Optical Master Inspection Dividing Head is the most accurate instrument of its kind for checking angular spacing. Accuracy is guaranteed within a total variation of 2 seconds of arc (± 1 second). This instrument is available in both standard and heavy duty models.

VINCO CORP., 9111 Schaefer Hwy., Detroit 28, Mich.

NEW

by AIRETOOL...

Heavy Duty, Small Wheel Pneumatic GRINDER

Grinding and finishing of dies, patterns, castings or any metal parts can be done quickly and efficiently with this new Airetool pneumatic grinder. It's lightweight and compact for easy maneuvering around intricate construction. Powerful Airetool 3-blade ball bearing motor operates smoothly with constant power. Optional lever or button throttle. Precision ground, hardened metal parts assure long life.

SPECIFICATIONS • MODEL 400G
Speed: 19,000 rpm
Size: 1½" dia. x 6½" long
Weight: 1½ lbs.
Capacity: ¼" collet chuck or
⅜" — 24 spindle
Operating Pressure: 90-100 psi

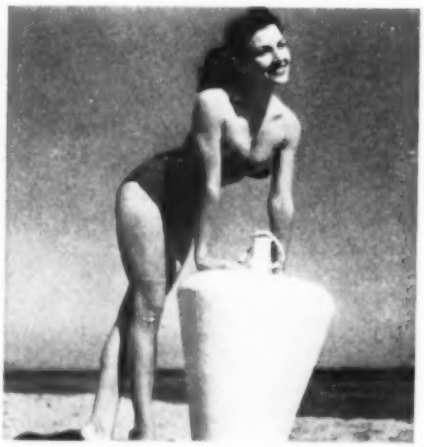
AIRETOOL
MANUFACTURING COMPANY
SPRINGFIELD, OHIO

CANADIAN PLANT: Brantford, Ontario
EUROPEAN PLANT: Vlaardingen, The Netherlands

Write for complete catalog on the Airetool line of portable pneumatic equipment for increased production and lower operating costs.

Airetool offices and representatives in principal cities of U.S.A., Canada, Mexico, Puerto Rico, South America, Hawaii, England, Italy, Europe, Japan.

CIRCLE 323 READER SERVICE CARD



OH BUOY, SAM . . . Think of all the time we could spend together if you'd only get things straightened out at the shop. There's a little old Threadwell Distributor down here who says that if you used Threadwell cutting tools you'd have more time and money . . . for me. *Photo by Peter Gowland for Threadwell Tap & Die Co., Greenfield, Mass.*

IT'S PLAIN TO see

A Boring Head That Won't Face is NOT Complete

NOW you can get a boring head that will BORE, FACE, TURN and GROOVE at no more cost than you would pay for a plain, single purpose boring head.

LOOK INTO THIS before you buy that new head. Write for full details.

CHANDLER TOOL CO.
Muncie, Indiana, U.S.A.

Chandler-Duplex
COMBINED BORING AND FACING TOOLHEADS

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SPROCKETS TO 72" PD. 2½ CP.
RACKS TO 20 FT. LONG. 3 DP
SILENT GEARS, RAWHIDE BAKELITE FIBROIL
HEAT TREATED, CASE OR FLAME HARDENED GEARS— OF CARBON OR ALLOY STEEL

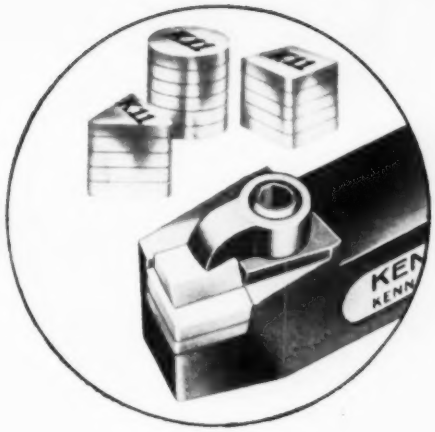
Ready for long, trouble-free use in bar straightening equipment, these precise examples of Stahl's craftsmanship in gear fabrication have been double-checked for strict compliance with specifications. Illustrated are 4 steel helical gears—24.697" F., 72 T., 3 D.P., together with 2 Hyten B3X steel shaft pinions 6.758" O.D., 16¼" F., 35" Length-over-all. Heat treated. Let Stahl end your gear worries—send for our estimate.

Stahl
GEAR & MACHINE COMPANY
3901 HAMILTON AVENUE
CLEVELAND 14, OHIO

CIRCLE 326 READER SERVICE CARD

CIRCLE 324 READER SERVICE CARD

KENNAMETAL* K11



A specialty grade in 1955 ... a production grade today

Created four years ago to provide the greatest possible resistance to abrasion, K11 soon demonstrated exceptional performance in finishing and light roughing of cast iron, alloyed cast iron, brass, bronze, and light alloys. Today, under certain conditions, K11 is also being used for light cuts on steel, as well as for machining unfired ceramic materials, resin materials, and plastics.

Having a hardness of 93.0 Rockwell A, K11 has been found particularly suitable for such precision operations as boring brake drums, machining cam shafts, finishing pistons and sleeves. It is also recommended for die inserts for compacting ceramics, abrasive wheels and other applications involving severe abrasion.

Here are a few examples of K11 "success" stories from many varied applications:

A. Turning SAE 1213 steel rotors . . . At 298 sfm (2550 rpm), K11 increased pieces per insert from 750-1000 to 7500-9000.

B. Machining cast iron . . . K11 averaged 11.7 pieces with .008″ wearland. Closest competitive carbide could produce only 9.7 pieces with .016″ wearland. Considering rate of wear, K11 performance represents a 3 to 1 improvement.

C. Machining Fiberglass missile parts . . . on tests K11 provided 15% greater tool life than the best of three other makes of carbides. K11 has been used continuously on this job for over a year.

D. Finish facing modular iron flywheels . . . K11 increased output from 30 to an average of 100 pieces per cutting edge.

E. Boring welded bracket of 1020 steel . . . K11 is producing 70% more pieces per cutting edge at 100 sfm, .020″ depth and .002″ feed.

K11 is now available from stock ... at stocked grade prices

Due to outstanding performance on these and many other difficult jobs, demand for K11 has increased rapidly. To meet this growing popularity, K11 inserts are now available from stocks at Kennametal plants in Latrobe and Detroit. Triangular, square and round inserts with negative rake; also square and triangular inserts with positive rake are being stocked and are available at stocked grade prices, Group II.

For more information about this hard Kennametal grade, see your Kennametal Representative or write KENNAMETAL INC., Latrobe, Pa.

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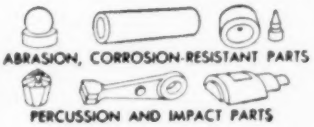
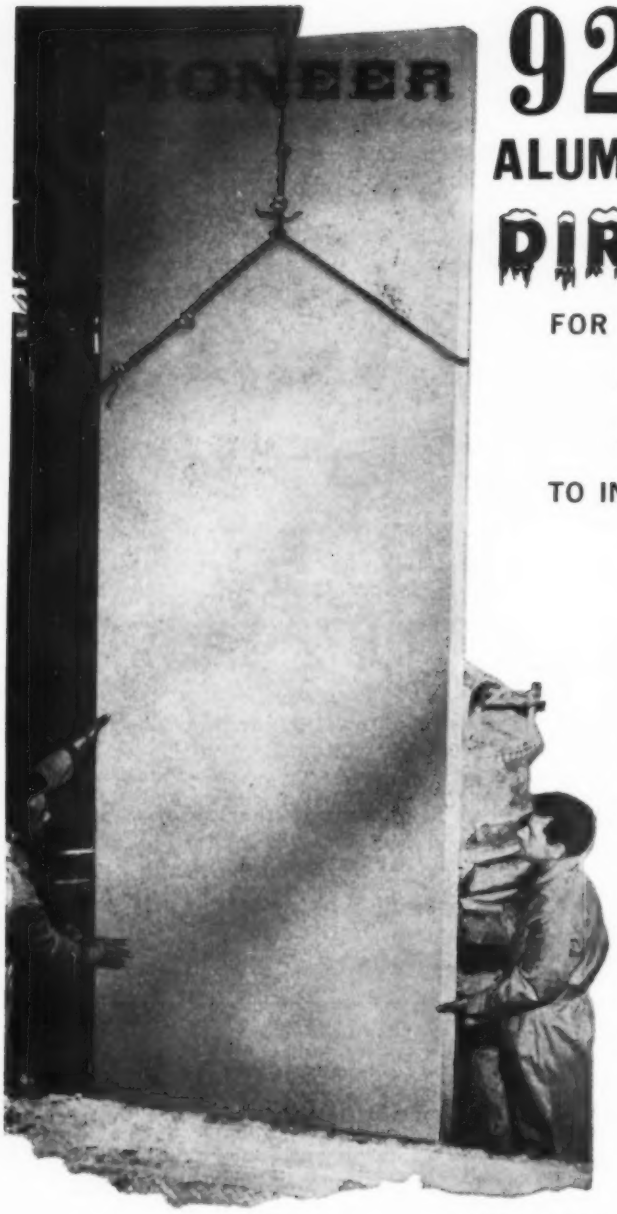
INDUSTRY AND **KENNAMETAL** ...Partners in Progress





921-T-*DC*

ALUMINUM TOOLING PLATE

DIRECT CHILLED

FOR *Greater Density, Less Porosity and Improved Stability*

TO INSURE:

1. EASIER MACHINABILITY
2. PRECISE DIMENSIONS
3. SUPERIOR FLATNESS
4. BETTER SURFACE FINISH
5. LOWER COST TOOLING

These five outstanding advantages are possible because, starting with a finer grain structure and an inherent stability not approached in any other lightweight tooling material, each 921-T-*DC* tooling plate is machine finished to exact dimensions before shipment.

Not only is 921-T-*DC* being used by leading airframe, automobile, appliance and other metal working industries for jigs, fixtures and production tools, but is finding acceptance for use in the manufacture of precision equipment and components where close tolerances, uniformity and stability are prime requirements.

GET THE FULL STORY

• • • A complete description of Pioneer 921-T-*DC*; its versatility and adaptability; illustrations of applications, are contained in a new brochure available without cost or obligation through any of the Pioneer distributors listed below.

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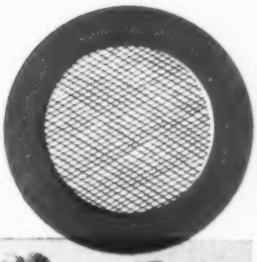

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The self-sharpening stones shear off metal rapidly and produce any finish you desire—as fine as 2 micro-inches RMS in hardened steel.

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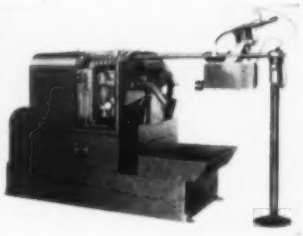
Automatic operation—from loading to final cut-off. Handles solid bar stock up to 3" O.D.—tubing up to 8" O.D. Cuts any material that can be turned. 16 spindle speeds.



CATALOG

Has complete specifications of all models. Illustrates parts that are being formed, grooved, flanged or chamfered and cut off in a single operation at a high rate of speed. Also describes the automatic feeder, hot spinning machine for sealing ends of tubing, and the Modern Safety Drill Table.

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MODERN MACHINE TOOL CO.
2005 Losey, Jackson, Michigan

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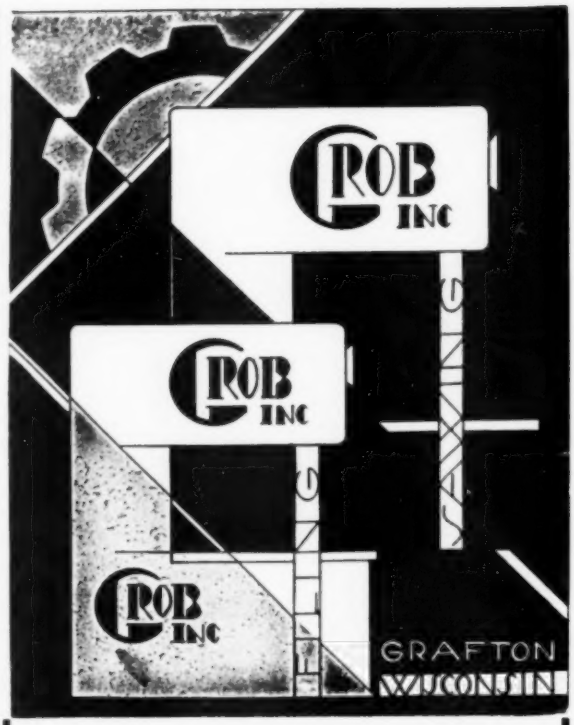

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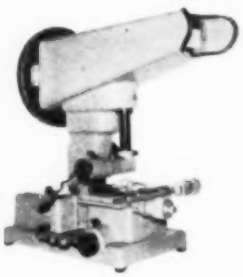

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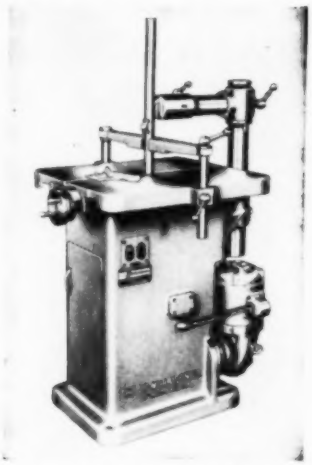
This new MORRISON KEYSEATER can make money for you



Install it in your shop. Its low cost will amaze you. Watch it pay for itself. You can quickly eliminate costly production tie-ups caused by waiting for expensive outside services. This is not an ordinary keyseater. The Morrison Keyseater is quality built with machine tool accuracy. Practically anyone can operate it. It has automatic feed, automatic stop to cut off feed at given depths, automatic relief to back the work away from cutters, automatic centering, automatic lubrication. NO BRUSHINGS REQUIRED. Cuts keyways 1/16" to 1".

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Please send Free "Keyseater" Catalog, showing specifications.

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CIRCLE 333 READER SERVICE CARD

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LINDE's NEW PLASMARC TORCH SERVICE

Brings Industry Production Parts From Refractory Metals

No other method of fabricating refractory metals can match this. . . . The high melting points of tungsten, tantalum, and molybdenum are no longer a problem. For LINDE's new *PLASMARC* Torch, working in the temperature range between 15,000 and 30,000 degrees K., can coat parts or form shapes of virtually any size or complexity. It's an entirely new way to make such articles as rocket nozzles, crucibles, components for electronic and X-ray use, and parts for atomic energy equipment!

The quality of these pieces is uniformly high. Tolerances can be held to .002 in. or better. The metal loses none of its purity and superior density is achieved.

With the *PLASMARC* Torch, LINDE is equipped to supply you with parts made of, or coated with, refractory metals; or made of a variety of metals combined with non-metals or reinforced plastics. LINDE will also provide a wind-tunnel materials testing service based on this device. For information on this extension of LINDE's well-known Flame-Plating service, write Dept. AW-13, LINDE COMPANY, Division of Union Carbide Corporation, 30 East 42nd Street, New York 17, N.Y. In Canada: Linde Company, Division of Union Carbide Canada Limited.

The *PLASMARC* Torch employs a non-transferred electric arc to generate such high temperatures that powder or wire fed into the chamber is literally melted. Inert gases flowing continuously carry the metal particles in a plastic state and deposit them on the workpiece at near-sonic speeds. Jets of CO_2 cool the particles instantly to form heat- and erosion-resistant material. Coatings—even on graphite—have an excellent bond. Shapes are built up on machined mandrels, which are then etched away to leave parts such as those shown above.

Linde UNION CARBIDE

"Linde", "Union Carbide" and "Plasmarc" are trade marks of Union Carbide Corporation.

"Far Superior to its Competition"...

. . . states Mr. Creighton Blanchard, toolroom superintendent at New Hampshire Ball Bearings, Inc., Peterborough, New Hampshire

THE NEW, IMPROVED THOMPSON TYPE D HAND FEED

SURFACE GRINDER

is winning enthusiastic approval wherever precision work is required

Here's what Mr. Blanchard has to say about the new Type D machine:

"We have three grinders in our toolroom—a Thompson and two competing machines. In our general toolroom grinding, especially on carbide and hard metals, we find the Thompson Type D so superior that we have recently purchased another Thompson just like it. All our precision work goes on the Thompson."

Compare these features

- Steel roller anti-friction slides eliminate ball creep and increase rigidity.
- 14" standard vertical capacity under 7" wheel at no extra cost with no loss in vertical capacity when using wet attachment.
- Solid support through entire length of bearing quill assures extra fine finish.
- 5 inch table movement per turn of handwheel improves quality of finish and speeds up operations.
- No backlash, anti-friction ball nuts and screws on cross feed prevent wheel from creeping away from work in shoulder grinding.
- Swing-out stop for table dog contact permits quick movement to wheel dresser.
- Immediate delivery available.

Send for descriptive literature on the new Thompson Type D Grinder.

THE THOMPSON GRINDER CO.
SPRINGFIELD, OHIO

"Keep Thompson in mind for that daily grind"

Thompson SURFACE GRINDERS

Tool Steel Topics

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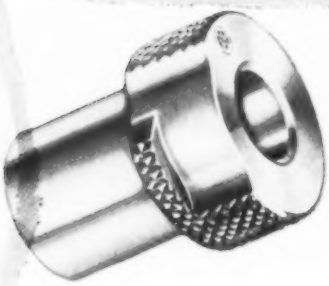

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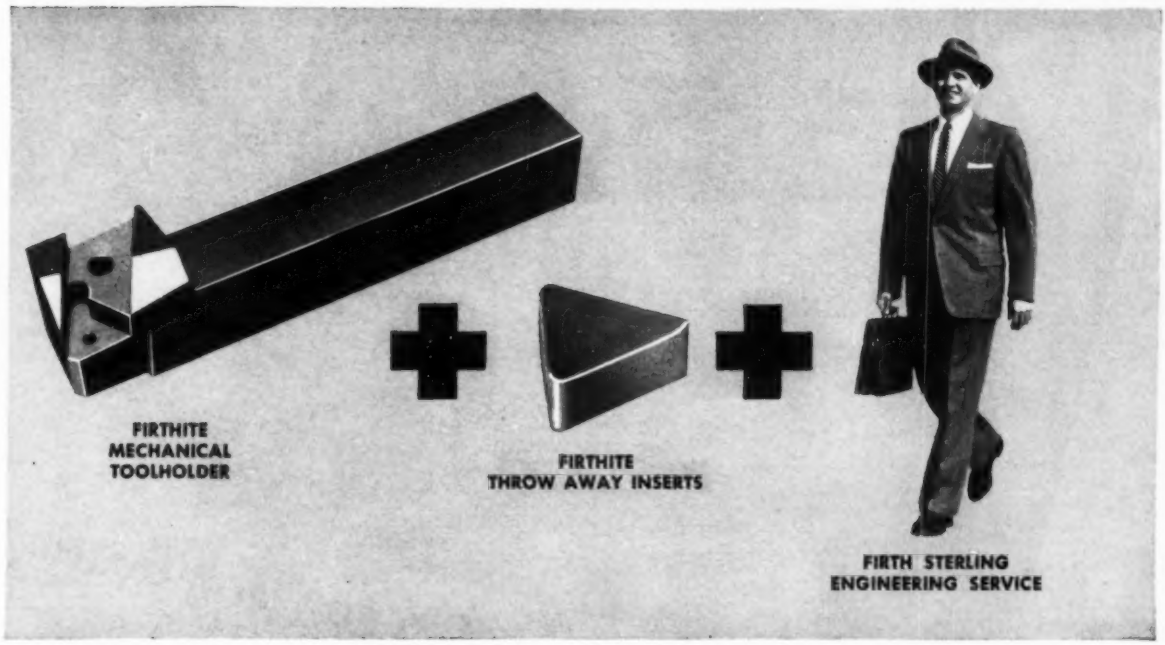

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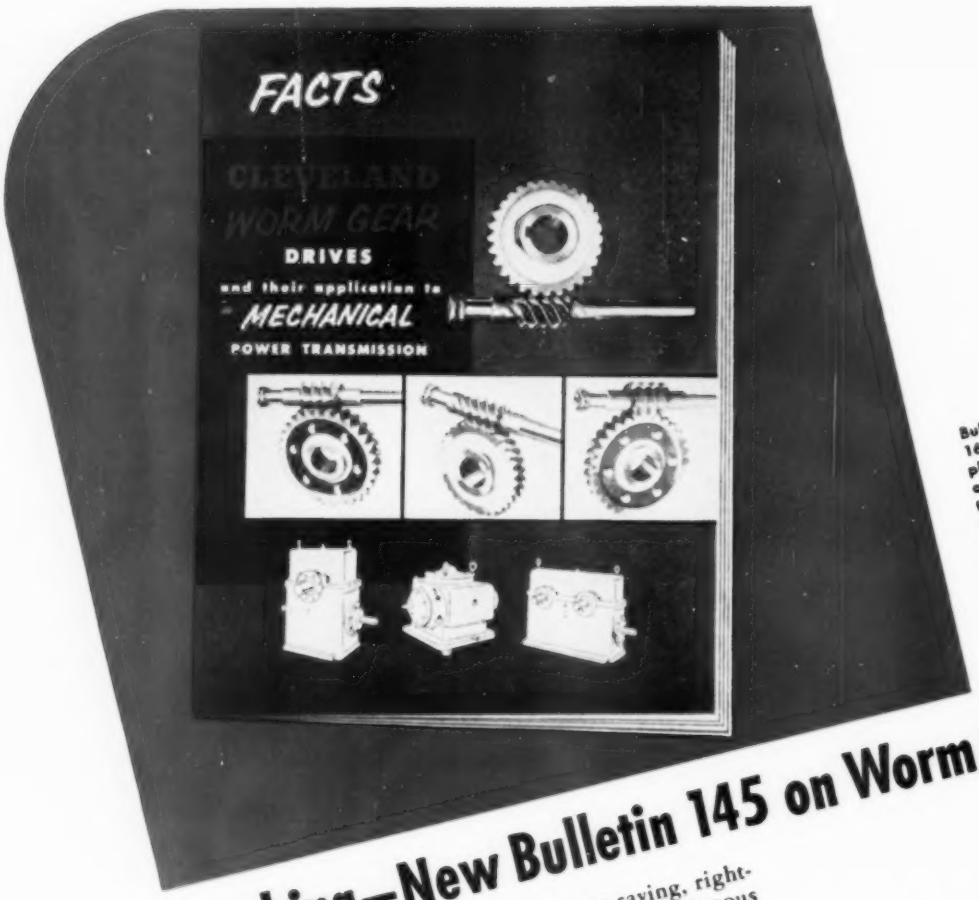

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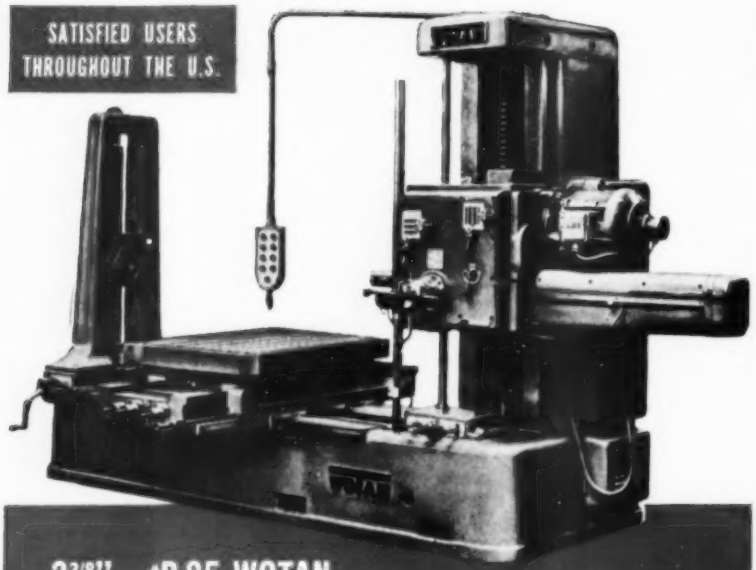

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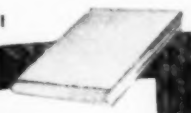

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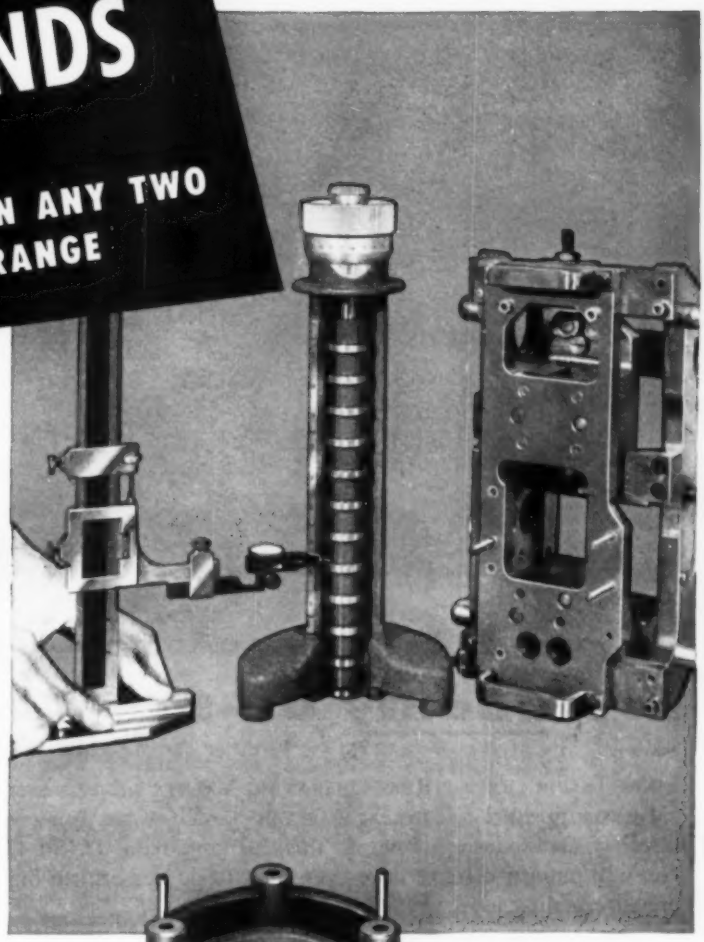

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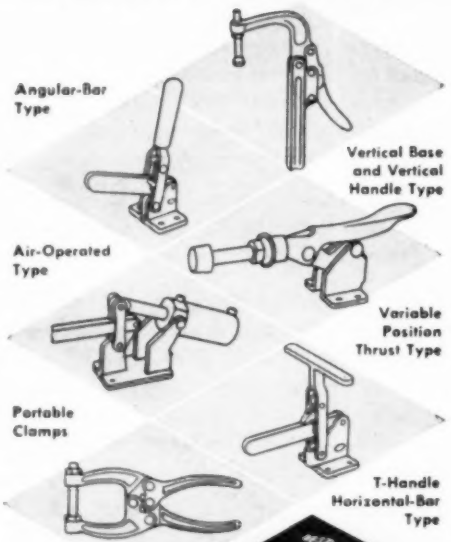

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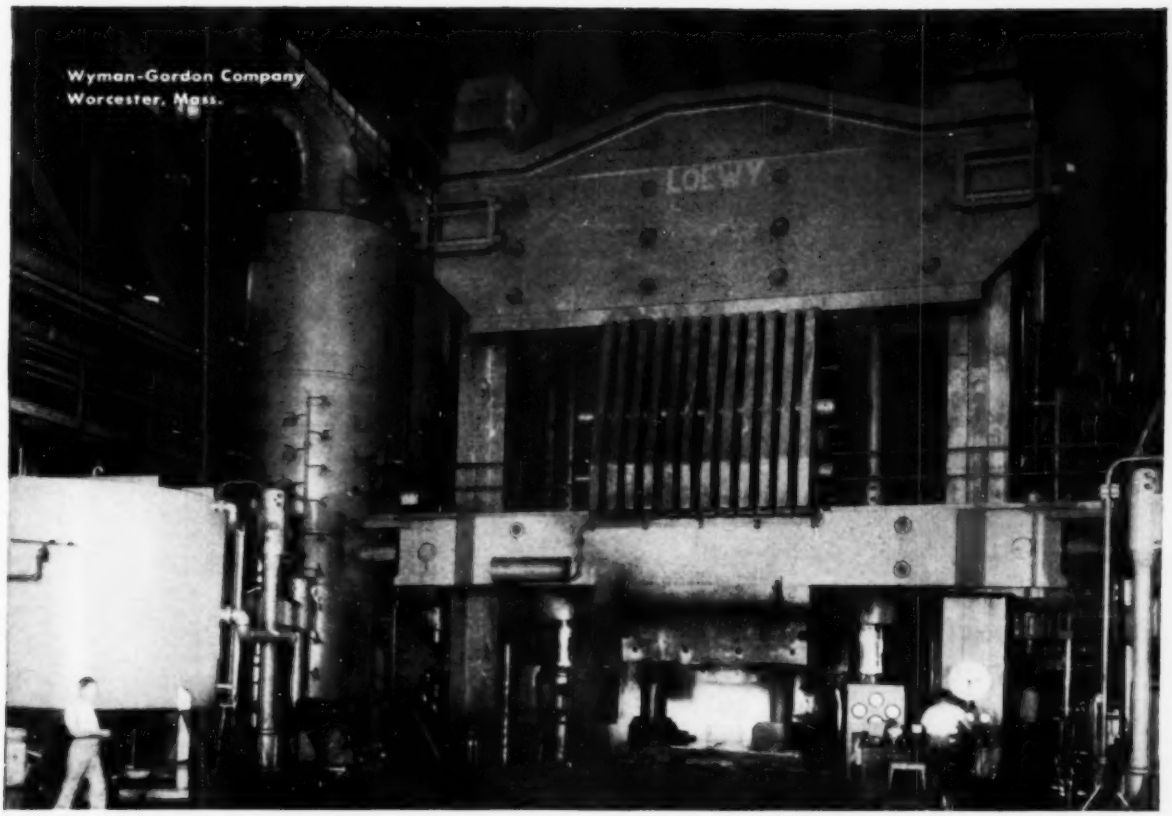

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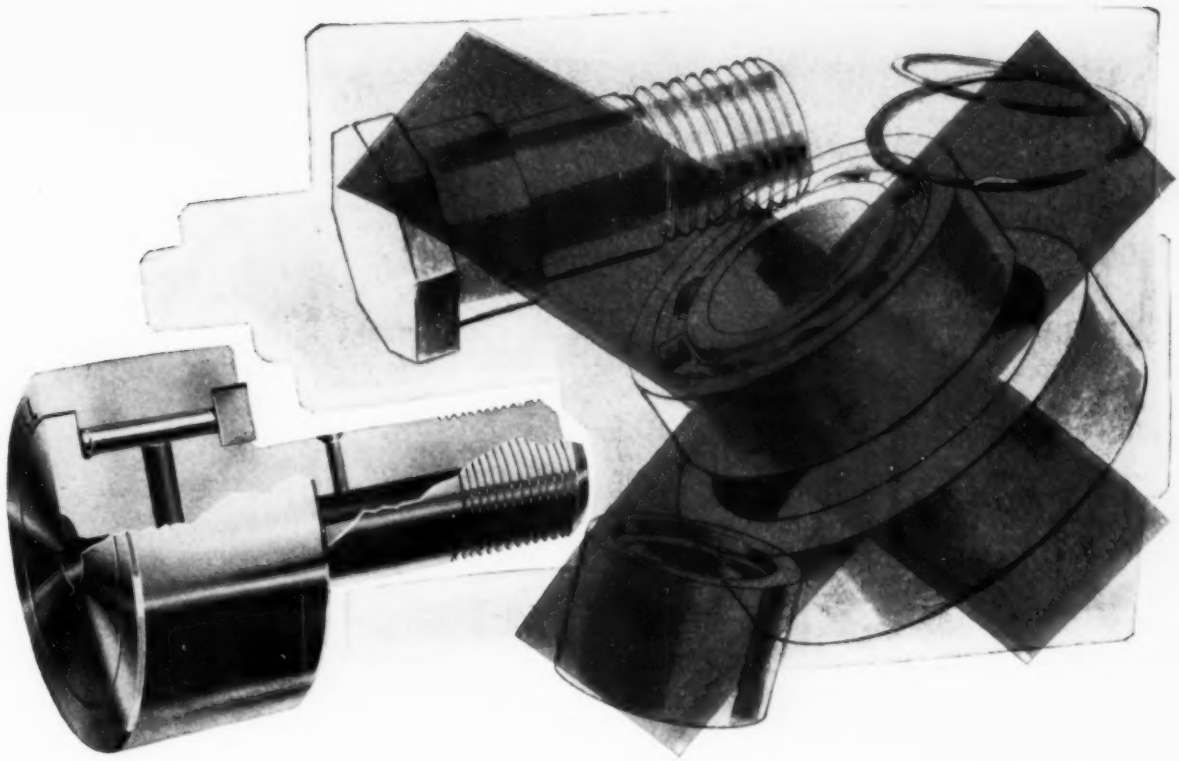

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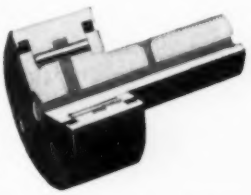

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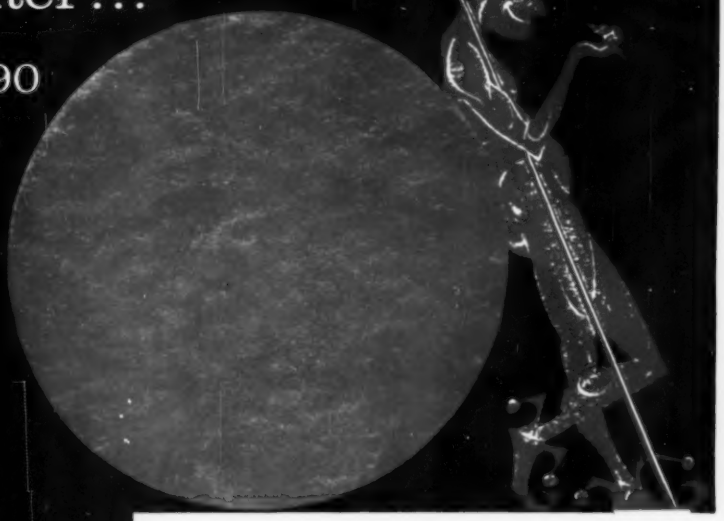

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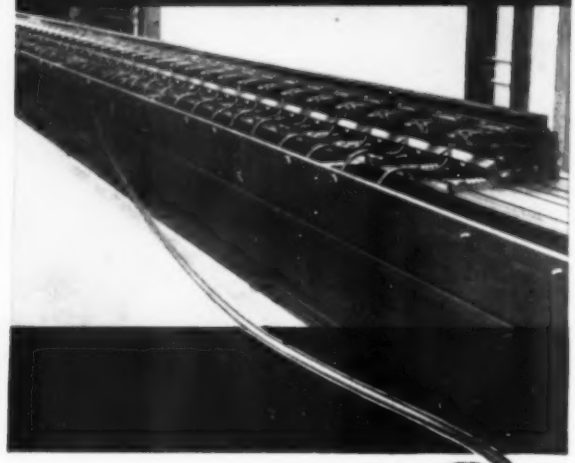


THIS HAND
clamps
96 cylinders
from one source

It's a fact! This hand, with one pump activates 96 clamps simultaneously. The Newton Hydraulic Clamping System of pumps, cylinders and mounting parts provides ease of application . . . Cuts production time . . . And is moderate in cost.

Learn more about this universal clamping system. See your Newton distributor now or write for free catalogue, with full scale templates provided.

NEWTON

NEWTON HYDRAULIC
TOOLING COMPANY
AUBURN, MASSACHUSETTS, U.S.A.

CIRCLE 355 READER SERVICE CARD

Loosens
rusty nuts, bolts, couplings

SAVES **Time** • SAVES **Labor**
SAVES **Expense of Broken Parts**

- Quickly cuts rust, gummed-up oil and grease, hardened paint
- Penetrates the tightest places.

Tasgon comes in handy "tool-kit-size" 3 ounce cans; pints, quarts and gallons. Send for sample.

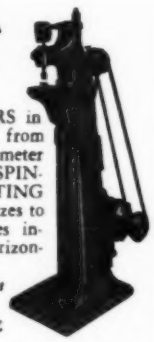
the **penetrating** rust solvent

Samuel Cabot

SAMUEL CABOT INC.
236 Oliver Bldg., Boston 9, Mass.

CIRCLE 356 READER SERVICE CARD

GRANT



RIVETERS — PIONEERS in their line — head rivets from smallest to ¾" diameter either by NOISELESS SPINNING or VIBRATING HAMMER method — Sizes to meet all needs — Types include Vertical and Horizontal Multiple Spindles.

Write for literature and don't forget to send samples.

THE GRANT MFG. & MACHINE CO.
85 Silliman Ave., Bridgeport, Conn., U. S. A.

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RANDALL and STICKNEY
Dial Gauges and Indicators

are accurate, reliable and built to stand hard usage.

eter, balanced dial 0-25-0 with .0005" Model "C 50 B" has a 2½" overall diam- graduations, ½" range and movable dial easily set at zero.

The cases on all R. & S. Gauges are made from sturdy castings. The case and plate are two separate units so that repairs can be made easily.

This style instrument can be furnished with various dials, graduations and ranges, in both English and Metric. There is an R. & S. Gauge for practically every purpose. Write for circulars describing our complete line.

FRANK E. RANDALL CO., INC.
248 Ash St
Waltham 54, Mass., U.S.A.
Makers of Dial Gages Since 1898

CIRCLE 358 READER SERVICE CARD

YESTERDAY'S PIONEER . . . TODAY'S LEADER

WELDON / COUNTERSINKS AND DEBURRING TOOLS

60°, 82°, 90°, 100° ANGLES

CHATTERLESS!

Greater ease in cutting and longer life are the outstanding features of these Weldon tools for countersinking and deburring operations.

Chatter is eliminated because of the single cutting edge.

A trial will convince you.

THESE TOOLS INCLUDE CUTTING DIAMETERS RANGING FROM 1/64" TO 3"

WRITE FOR FURTHER DETAILS

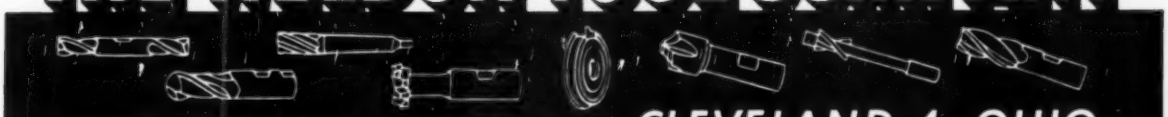
40 YEARS OF LEADERSHIP 1918—1958

Catalog list numbers are now marked on all Weldon tools and holders as an aid when reordering . . . another WELDON FIRST.

Weldon distributors throughout U. S. A. and Canada carry complete stocks to serve you.

D88

THE WELDON TOOL COMPANY



3000 WOODHILL ROAD · · · CLEVELAND 4, OHIO

I'D BE SO NICE TO COME HOME TO Harry, if you didn't bring your work, too. I don't know much about gages but that nice young man next door says that his plant standardizes on Threadwell Gages. He has plenty of free time. Maybe you would, too, if you tried Threadwell Gages in the shop. *Photo by Peter Gowland for Threadwell Tap & Die Co., Greenfield, Massachusetts.*

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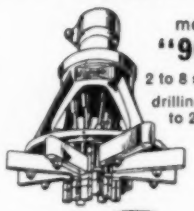
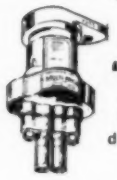
For LOW COST Hole Production
Pick a MULTI-DRILL® to Fit the Job



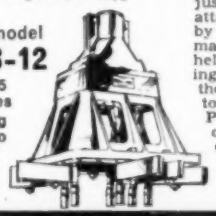
model "900"
2 to 8 spindles
drilling area to 22½"

model "500"
2 to 6 spindles
drilling area to 18½"

model "3-22"
2 to 15 spindles
drilling area to 35½"



model "400"
2, 3 or 4 spindles
drilling area 3¼"

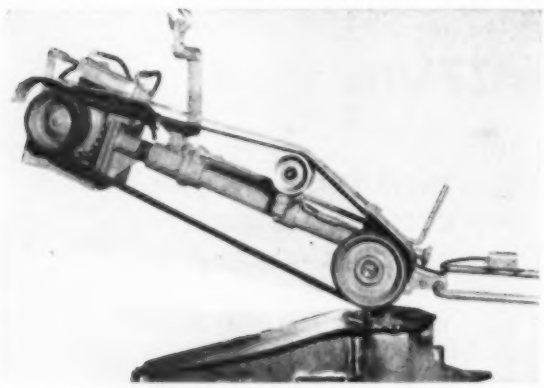


model "8-12"
2 to 15 spindles
drilling area to 25½" x 21¼"

Commander MULTI-DRILLS—adjustable multiple spindle drill press attachments—are sold and serviced by a nation-wide network of Commander Distributors—experienced, helpful specialists in solving drilling and tapping problems. Write for the name of your nearest Distributor and the complete Commander Production Tool Catalog which contains full details on every MULTI-DRILL and many other production drilling and tapping tools.

Commander MFG. CO.
4238 W. Kinzie Street · Chicago 24, Illinois

CIRCLE 362 READER SERVICE CARD



Does the Big, Tough, Difficult Jobs: Quickly and Easily

Nothing can remove metal as fast as the G & P Heavy Duty and XTRA Heavy Duty abrasive belt grinders. Free bulletin gives you full details, specifications and examples of special applications. Available in many belt sizes, various speeds and adjustable air tensioning for quick belt change and maximum belt life. Write for informative Bulletin No. 110.

Grinding and Polishing Machinery Corp.
SUCCESSORS TO VONNEGUT MOULDER CORPORATION
2530-H WINTHROP AVENUE, INDIANAPOLIS 5, INDIANA

CIRCLE 361 READER SERVICE CARD

YOU'D BE LATE, TOO, if you had the trouble I've had in my toy shop. We never had such a demand—rockets, space ships, burp guns—I thought we'd never make enough. You can bet that we'll use Threadwell Cutting Tools next year so our production will run smoothly. And can you imagine . . . those wiseguy reindeer want overtime. *Photo by Cobb Shinn for Threadwell Tap & Die Co., Greenfield, Massachusetts.*

CIRCLE 363 READER SERVICE CARD

NOW HIGH PRECISION FOR EVERY SHOP AREA

with Cleveland's
TRANSISTORIZED INDICATOR
INDI-AC, Jr.
The INDI-AC, Jr. embodies most of the features of the standard INDI-AC electronic indicator

☆ **OPERATES ANYWHERE**
Portable — 4½ pounds — 6" x 7" x 3½"
AC and permanent, chargeable battery, operated
Unaffected by shop conditions

☆ **USE FOR ANY GAGING PURPOSE**
3 scales — thousandths — tenths — millionths
Zeros and readings coincide on all scales
Reversible action gage head. Light Tip Pressure.

☆ **NO MAINTENANCE PROBLEM**
Exclusive PROTECTOR TIP*
No battery replacement
Long life transistors
No mechanical parts to wear

other CLEVELAND PRECISION INSTRUMENTS

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MICRO-AC—Electronic Micro-Comparator

PAR-AC—Electronic Production Gage

INDI-RON—Ultra-Precision Roundness, Squareness and Concentricity Gage

ROUGHNESS METER—For surface finish measurement

AU-MAC—Automatic Machine Control and Positioning Systems

Ask for a demonstration and see why CLEVELAND Gages give you more.

*Patent Applied For.

Cleveland INSTRUMENT COMPANY
6220 East Schaaf Road • Cleveland 31, Ohio

CIRCLE 364 READER SERVICE CARD

MACHINE TOOLS
FOR SALE — FROM STOCK

RBG = Rebuilt & guaranteed
RCG = Reconditioned & guaranteed

AUTOMATIC
1¼" Warner & Swasey 6 Spdl. (1955) $24,500
BOREMATIC
#45 Heald, Dbl. End, 4 Spdl. RBG (1947) 12,500
VERT. BORING MILL
24" Bullard Vtl. w/side head 1943 RBG 6,950
DUPLEX BROACH
5 ton—42" Cinci., Vert. Hydro. (1950) 8,500
HORIZ. BAR
2½" G&L #25RT w/Rot. Tbl 1943, RBG 7,250
MULT. DRILL
48 Adj. Spdl. W7 Baush RCG (1943) 12,500
INT. GRINDER
109 Bryant RBG (1947) New Spdl. RBG 6,950
ROTARY SURFACE GRINDER
16A2 Blanchard Autom. Sizing (1948) 5,950
T. R. LATHE
12x20" Rivett 1020S 3500 RPM, RBG '50 4,450
HD LATHE
27 x 84" Monarch 505 RPM, RBG (1942) 11,500
TURRET LATHE
#3 Warner Swasey, Barfeed RCG (1951) 7,250
TURRET LATHE
#4 Warner Swasey, Barfeed, RBG (1942) 5,850
HORIZ. MILL DIAL TYPE
#2 Cincinnati, 1500 RPM, RBG (1942) 5,750
MULTIMATIC
16"—8 Spdl. Bullard D, Dbl Index (1942) 10,500
PRESS
55 Ton A3½ Niag OBI, Flywheel RBG 2,950
87 Ton 7S Verson Geared OBI 6" Str RCG 6,950

All Machines Carry Regular 30 Day Return Privilege Guarantee

"MIDWESTERN"
336 Midland Bank Building
Minneapolis 1, Minnesota

SEARCHLIGHT SECTION
(Classified Advertising)
EMPLOYMENT: BUSINESS: "OPPORTUNITIES" :EQUIPMENT :USED OR RESALE

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EMPLOYMENT OPPORTUNITIES: $21.00 per inch. Subject to Agency Commission.

EQUIPMENT & BUSINESS OPPORTUNITIES: $17.00 per inch for all advertising appearing on other than a contract basis. Not subject to Agency Commission.

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DISCOUNT OF 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

Send New Advertisements to Classified Advertising Div. of American Machinist, P.O. Box 12, N.Y. 36, N.Y.

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LARGE MACHINE TOOLS

69"x78' CC NILES G.H. LATHE	$16,500
64"x21' CC NILES G.H. LATHE	8,950
53"x30' CC PUTNAM G.H. LATHE	7,950
44"x32' CC PUTNAM G.H. LATHE	4,950
10'-12' BEMENT EXTENSION TYPE BORING MILL	8,950

(WRITE FOR FREE LISTING)

CARNEY MACHINERY COMPANY
Allentown, Penna. HEmlock 5-7000

AVAILABLE CONTRACT WORK

Leading British Manufacturer of a wide range of Gear-cutting Machine Tools is interested in manufacturing its products in the U.S.A., under Licence or by other arrangement with a first-class American Machine Tool Company with good sales coverage, and invites interested parties to write to

CWA-9782, AMERICAN MACHINIST
Class. Adv. Div., P.O. Box 12, N.Y. 36, N.Y.

Watch — the *Searchlight Section* for Equipment and Employment Opportunities

POSITION WANTED

Sales Executive—Graduate Mechanical Engineer with 20 years experience selling and directing sale of industrial machinery coast-to-coast. PW-9581, American Machinist, 520 N. Michigan Ave., Chicago 11, Ill.

INDUSTRIAL INSTRUMENT REPAIRS
PROMPT SERVICE

Speed Indicators • Last Word Indicators • Dial Test Indicators • Swiss Indicators • Hand Tachometers • Dial Depth Gages, etc.

UNIONDALE PRECISION REPAIR SERVICE CO.
646 Waverly Place, Uniondale L. I., N. Y.

Eastern Rebuilt Machine Tools

THE SIGN OF QUALITY — THE MARK OF DEPENDABILITY

ENGINE LATHES

12" Sebastian "Viking", m.d.
13"x48" centers Pratt & Whitney, m.d.
14"x31¼" centers Lodge & Shipley, m.d.
14"x32¼" centers Springfield, m.d., taper
14"x33" centers Sidney, m.d.
14"x33½" centers Lodge & Shipley, m.d.
14"x36" centers LeBlond Geared Head, s.p.d.
14"x36" centers Pratt & Whitney, cone
14"x54" centers LeBlond Regal, m.d.
16"x28¾" centers Hendy Yoke Head, m.d., taper
16x29½" centers Lodge & Shipley Selective Head, m.d.
16"x29½" centers Monarch Geared Head, m.d.
16"x30" centers Monarch, m.d., taper
16"x30" centers Hendey Geared Head, m.d.
16"x30" centers Reed Prentice, m.d.
18"x30" centers American, m.d., 8 speed
18"x48" centers Lodge & Shipley, m.d.
18"x49" centers Lodge & Shipley, m.d.
18"x51" centers American Geared Head, m.d.
18"x51" centers Hendey Geared Head, m.d., taper
18"x54" centers American, m.d., Timken
18"x60" Cincinnati Tray Top, m.d.
18"x106" centers (110" centers tailstock overhang) American, m.d.
18"x126" centers Lodge & Shipley Selective Geared Head
19"x68" centers LeBlond Geared Head, m.d.
20"x46¾" centers Lodge & Shipley, m.d.
20"x48" centers Boye & Emmes, m.d.
20"x55" centers Greaves-Klusman, m.d.
20"x72" centers Boye & Emmes, cone motorized
20"x96" centers Boye & Emmes, Model C, m.d., new
21"x42" centers LeBlond, m.d., taper
21"x61½" centers LeBlond, m.d.
24"x18'3¼" centers (if used with tailstock) 24" bed Lodge & Shipley, m.d.
25"x120" Boye & Emmes, vee belt m.d.
25"x49" centers LeBlond Geared Head, m.d., taper
25"x50"x7'7" centers LeBlond Gap, m.d.
27"x27" centers Niles Time Saver, 2 carriages
27"x96" centers American H.D., m.d., late
27"x104" centers Niles "Time Saver", m.d.
27"x120" centers LeBlond, m.d., 1944
27"x168" centers LeBlond, m.d.
30"x76" centers Niles-Bement-Pond, m.d., taper
42"x31'-1½" centers American H.D., m.d.
54"x174" centers Houston, Stanwood & Gamble, Heavy Type, m.d.

SEND FOR COMPLETE STOCK LIST

THE EASTERN MACHINERY COMPANY
1004 Tennessee Avenue, Cincinnati 29, Ohio
MElrose 1-1241
CABLE ADDRESS EMCO

Dale W. Wright

ALL REBUILT MACHINE TOOLS ARE NOT THE SAME

As a sales engineer at Miles for the last 3 years I've had the satisfaction of knowing that the machines I've sold would perform like new because I've seen how they are rebuilt from the base up in our plant.

BALANCER, Model 2EO Tinius Olsen, 1948
BORER, No. 1212 Excello dbl. end
BORING MILL, 8¾" bar No. 5 Defiance, 1942
BORING MILL, 4" Universal Tri-Way 1000 RPM
BORING MILL, 60" Gisholt vert., PRT
CENTERING MACHINES, Nos. 53 & 56 Sundstrand up to 72" between centers
CHUCKER, 675 New Britain 1940
DRILL No. 20 HD Baker hydr. late
DRILL, HEAVY DUTY, No. 262 Barnes, swing 26", capacity 2", No. 5 M.T., 1943, Q.C.C.
GRINDERS, C'LESS, No. 12 Landis, 1947
GRINDER, CYL. 4" x 12" No. H, Landis, 1943
GRINDERS, UNIV. 14" x 14" Mod. 112 Rivett
GRINDERS, CYL. 20" x 72" Landis, 1943
GRINDER, INT. 72AS Heald, Univ., Hydr.
GRINDER, INT. No. 74 Heald Hydr., 1941
GRINDER, SURF. 8" x 24" DoAll hydr. 1948
GRINDER, SURF. 20" x 24" No. 25A Heald
GRINDER, SURF. 36" No. 16 Blanchard 1936
GRINDER, SURFACE, 12" x 16" x 36" Mattison, Mag. chuck and Rect., 1942
GRINDER, CUTTER, 30" Ingersoll, 1942
GRINDER, CARBIDE, Nos. 48 and 49 Excello
GRINDER, RADIUS, No. 49 VanNorman, late
HUB SHARPENER, Type HRS Barber Colman
KELLER, BL2416 Pratt & Whitney 8 Spdl., 1941
LATHES, ENGINE, 13", 15" & 17" LeBlond
MILLER, AUTO. 2-20 Kent Owens, 1942
MILLER, AUTO 36" No. 33 Sundstrand
MILLER HAND, No. 2RV Kent-Owens, 1942
MILLERS, No. 10 & 3 VanNorman Duplex
MILLER, PLAIN, No. 2 Cincinnati HSDT, 1940
MILLER, PLAIN, No. 5H K. & T MSDT 1943
MILLER, VERT. No. 2 Brown & Sharpe HSDT, 1943
MILLER, No. 36 VanNorman, ram type, 1942
MILLING MACHINES, HORIZONTAL, No. 5H Kearney & Trecker, plain with Vert. Hd., 1941
ROUTERS, Type A-1R Onsrud Radial 84", late
SAW, 6" x 6" No. 6 Marvel Hack, late
SAW, 10" x 10" Racine Hydr. Hack, 1941
SHAPER, 6" P&W vert., also 12"
SHAPER, 16" Rockford Hydr. Univ. 1943
SLOTTER, 36" Rockford Hydraulic, 1942, excellent
TAPPER No. 10 Warner & Swasey, 1948

OVER 1,000 NEW AND USED MACHINE TOOLS IN STOCK
WRITE FOR LATEST STOCK LIST

MILES MACHINERY COMPANY
2039 EAST GENESEE • SAGINAW, MICH. PL. 7-3105

FALK MACHINERY COMPANY

Every Item Guaranteed as Represented

No. 3, No. 4 Cincinnati Vert. & Horiz. H.S.D.T. Mills, Late Type.

24", 36", 42", 54" BULLARD Vert. Turret Lathe, Turret Hd., Side Hd., M.D. Spiral.

No. 2, 4, 5 WARNER & SWASEY Univ. Preselector Turret Lathes, Bar Feed & Chucking.

24" x 24" x 96" MATTISON Hyd. Surf. Grinder. Mag. Chuck, Barnes Mag. Separator.

3'11", 3'x13" Cinci-Bickford Super Service Motor on Arm. Radial Drill.

4" x 18" CINCINNATI Cyl. Grinder, Late

675B BLISS Hi Prod. Press, Roll Feed, Scrap Cutter, Var. Sp. Dr., Late Type.

½B x 30" Pratt & Whitney Deep Hole Drill.

No. 3V VAN NORMAN Ram Type Vert. Mill, Late Type.

32" x 12' centers FARREL Traveling Table Type Roll Grinder, Excellent condition.

62" KING Vert. Boring Mill, L.H. Swivel Hd., R.H. Turret Hd., Side Head.

#3 MVB LELAND GIFFORD Drill Press.

OVER 1000 MACHINE TOOLS AVAILABLE IN STOCK . . . SEND US YOUR INQUIRIES

BUY FROM STOCK
Telephone
BAKER 5-5887

10 WARD ST.
ROCHESTER 5
N. Y.

Cimco

SELECT MACHINE TOOLS

1A—Warner & Swasey Turret Lathe Preselector Head late type assortment of tooling.
#2 Cincinnati Dial Type High Speed Vertical Mill, powerfeed to head, late type.
3'11" column American Hole-wizard Radial Drill, motor on head, 12 speeds, late.
#4 Cincinnati Hi Speed Dial Type Plain Mill, table 78½" x 16¼", 18 speeds to 1300 RPM.
12" Morey Vert. Slotter AC motor drive, 24" rotary table, latest type.
18" x 40" x 98" centers Norton Type "C" Cylindrical Grinder, two gaps, swing 40" and 28" in gaps, mechanical feed, late type.
20" Gould & Eberhardt Industrial Shaper, vise, front support, new 1947.
24" x 96" centers Boye & Emmes G.H. Lathe, 12 speeds, timken, late, taper.
42" Bullard Spiral Drive Vertical Boring Mill, extra high column, 4 jaw chuck table.
45T Giddings & Lewis table type boring mill, table 40 x 48, outer support, late type.
5'13" column American Hole-wizard Radial Drill, 15 HP AC motor, 32 spindle speeds.
6'19" column Fredick Economax Hydraulic Radial Drill, 20 HP AC mtr. on arm, 36 spindle speeds, hydraulic column clamp, late type.

Cincinnati Machinery COMPANY
3901 Kellogg Ave., Cincinnati 26, Ohio
Phone TRinity 1-0853

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STAMPING PRESSES
SQUARING SHEARS • PRESS BRAKES
REBUILT *and* GUARANTEED

WILL LEASE WITH OPTION TO PURCHASE, OR WILL FINANCE OVER LONG TERM

JOSEPH HYMAN & SONS
TIOGA, LIVINGSTON & ALMOND STS.
Philadelphia 34, Pa. Phone GArfield 3-8700

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"Searchlight" advertisers almost invariably report prompt and satisfactory results.
BE CONVINCED — send us your advertisement TODAY. *Address Classified Advertising Division.*
AMERICAN MACHINIST, P. O. Box 12, New York 36, New York

INDEX TO ADVERTISERS

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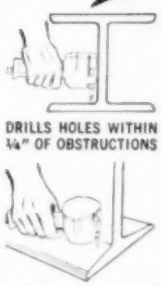
Winslow

SPACEMITE

Air-Powered DRILL MOTOR



With the heavy duty, rugged SPACEMITE you can drill holes within ¼" of bulkheads and other obstructions and within 9/32" radius in 90° corners. Replaces angle drills for most limited-access-area drilling.

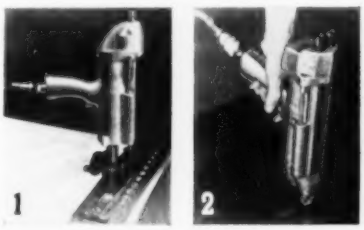
SPACEMITE accommodates standard threaded shank drills (¼—28 thd.), capacity through ⅜" diameter. Accommodates larger drills under overload conditions.

Start now to enjoy the cost-saving, increased-production benefits of the SPACEMITE in your plant.

HERE ALSO, ARE TWO WINSLOW AUTOMATIC POWER TOOLS YOU SHOULD KNOW ABOUT.

1 SPACEMATIC DRILL MOTOR
A heavy duty tool that approaches automation on drill countersinking applications. One of the most sensational cost-saving tools ever introduced to industry.

2 NUTPLATE DRILL MOTOR
A portable power tool used on Nutplate installations.



Write Today... for new SPACEMITE Bulletin and name of your nearest dealer. Also ask for data on SPACEMATIC and NUTPLATE Drill Motors.

Winslow PRODUCT ENGINEERING CORPORATION
47 ST. JOSEPH STREET • ARCADIA, CALIFORNIA
Manufacturers of vacuum hand tools and accessories for the nation's aircraft and manufacturing plants.

CIRCLE 365 READER SERVICE CARD

HOW TO RUN AN ENGINE LATHE

This 15-page *American Machinist* Special Report discusses engine lathes, and turning tools and operations. Many helpful drawings. 25 cents.

Reader Service Dept., *American Machinist*
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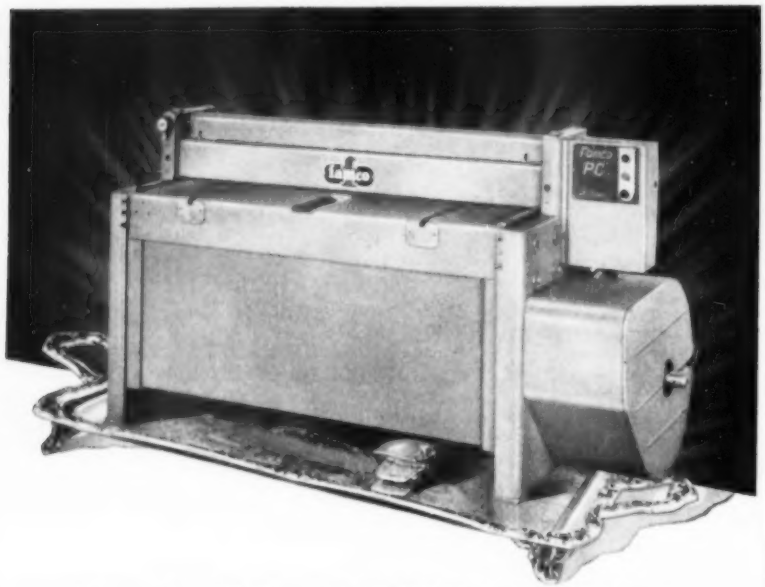

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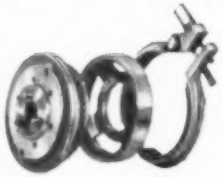

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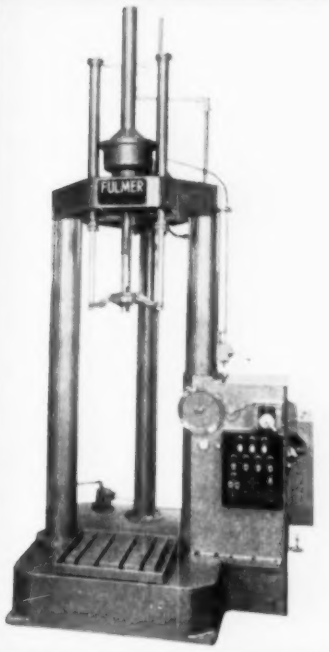

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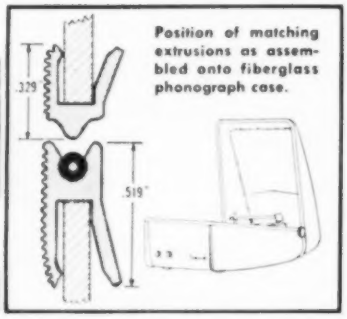
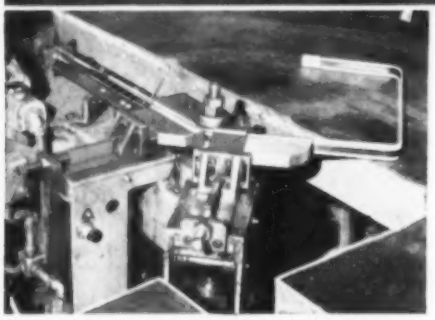
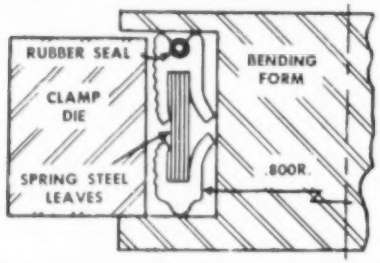
View of 12-year old Pines Model ¾ Bending Machine at Kinkead Industries Incorporated, Chicago, bending decorative aluminum extrusion closure strips.



Position of matching extrusions as assembled onto fiberglass phonograph case.



Close-up showing tooling employed in bending two matching extrusions simultaneously. Black strip separating two extrusions is spring-steel mandrel used to prevent collapse of open sections during bending.



Extrusions are positioned in tools as illustrated above. Die surfaces are nylon coated to prevent scratching the anodized finish. Rubber seal is installed in straight lengths before bending.

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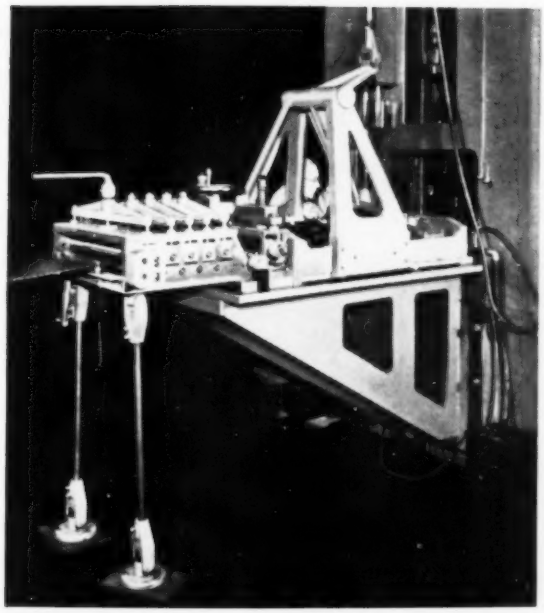

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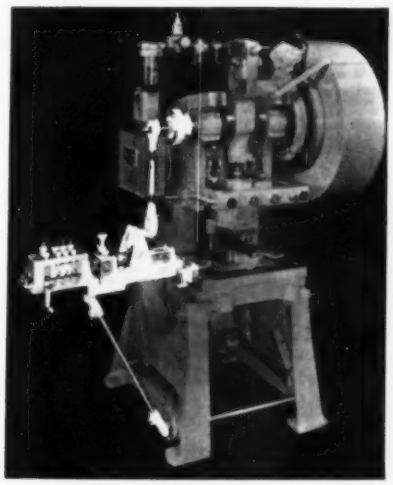

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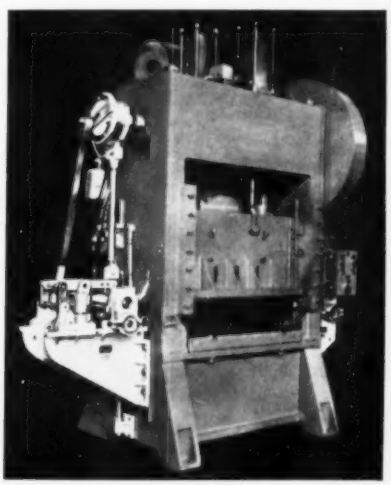

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